

Documented Code for datatool v2.10

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2012-07-18

This is the documented code for the datatool bundle. See [datatool-user.pdf](#) for the main user manual.

Contents

1	datatool-base.sty	2
1.1	Package Options	2
1.2	Utilities	3
1.2.1	General List Utilities	4
1.2.2	General Token Utilities	8
1.3	Locale Dependent Information	9
1.3.1	Currencies	16
1.4	Floating Point Arithmetic	17
1.5	String Macros	28
1.6	Conditionals	36
1.6.1	Determining Data Types	36
1.6.2	ifthen Conditionals	62
1.7	Loops	69
2	datatool-fp.sty	72
2.1	Comparison Commands	73
2.2	Functions	74
3	datatool-pgfmath.sty	77
3.1	Comparison Commands	77
3.2	Functions	78
4	datatool.sty	81
4.1	Package Declaration	81
4.2	Package Options	81
4.3	Defining New Databases	84
4.4	Accessing Data	100
4.5	Iterating Through Databases	111
4.6	DTLforeach Conditionals	133
4.7	Displaying Database	134
4.8	Editing Databases	142
4.9	Database Functions	146
4.10	Sorting Databases	158
4.11	Saving a database to an external file	167
4.12	Loading a database from an external file	170
4.13	Debugging commands	180

5	databib.sty	181
5.1	Package Declaration	181
5.2	Package Options	181
5.3	Loading BBL file	181
5.4	Predefined text	182
5.5	Displaying the bibliography	183
5.5.1	ifthen conditionals	196
5.6	Bibliography Style Macros	200
5.7	Bibliography Styles	204
5.8	Multiple Bibliographies	222
6	databar.sty	226
7	datapie.sty	248
8	dataplot.sty	259
9	person.sty	283
9.1	Package Declaration	283
9.2	Defining People	283
9.3	Remove People	285
9.4	Conditionals and Loops	286
9.5	Predefined Words	289
9.6	Displaying Information	291
9.7	Extracting Information	299
	Index	327
	History	336

1 datatool-base.sty

This package provides all the basic commands needed by various packages in the datatool bundle.

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{datatool-base}[2012/07/18 v2.10 (NLCT)]
```

Required packages:

```
\RequirePackage{etoolbox}
\RequirePackage{amsmath}
\RequirePackage{xkeyval}
\RequirePackage{xfor}
\RequirePackage{ifthen}
```

Version of required that fixes \su@ifSubStringInString

```
\RequirePackage{substr}[2009/10/20]
```

1.1 Package Options

verbose Define key for package option verbose. (This also switches the fp messages on/off if datatool-fp used.) This boolean may already have been defined if datatool has been loaded.

```
\ifundef{\ifdtlverbose}
{
  \define@boolkey{datatool-base.sty}[dtl]{verbose}[true]{}
}%
{}
```

math Determine whether to use fp or pgfmath for the arithmetic commands. The default is to use fp.

```
\define@choicekey{datatool-base.sty}{math}[\val\nr]{fp,pgfmath}{%
  \renewcommand*\@dtl@mathprocessor{#1}%
}
```

\@dtl@mathprocessor

```
\providecommand*\@dtl@mathprocessor{fp}
```

Process options:

```
\ProcessOptionsX
```

Load package dealing with numerical processes:

```
\RequirePackage{datatool-\@dtl@mathprocessor}
```

1.2 Utilities

`\dtl@message` `\dtl@message{<message string>}`

Displays message only if the verbose option is set.

```
\newcommand*{\dtl@message}[1]{%
  \ifdtlverbose\typeout{#1}\fi
}
```

`\@dtl@toks`

```
\newtoks\@dtl@toks
```

`\@dtl@tmpcount` Define temporary count register

```
\newcount\@dtl@tmpcount
```

`\dtl@tmplength` Define temporary length register:

```
\newlength\dtl@tmplength
```

`\dtl@ifsingle` `\dtl@ifsingle{<arg>}{<true part>}{<false part>}`

If there is only one object in *<arg>* (without expansion) do *<true part>*, otherwise do false part.

```
\newcommand{\dtl@ifsingle}[3]{%
  \def\@dtl@arg{#1}%
  \ifdefempty{\@dtl@arg}%
  {%
    #3%
  }%
  {%
    \@dtl@ifsingle#1\@nil{#2}{#3}%
  }%
}
```

`\@dtl@ifsingle`

```
\def\@dtl@ifsingle#1#2\@nil#3#4{%
  \def\dtl@sg@arg{#2}%
  \ifdefempty{\dtl@sg@arg}%
  {%
    #3%
  }%
  {%
    #4%
  }%
}
```

`\long@collect@body` Need long versions of 's `\collect@body`. These macros are adapted from the macros defined by `amsmath`.

```
\long\def\long@collect@body#1{%
  \@envbody{\@xp#1\@xp{\the\@envbody}}%
  \edef\process@envbody{\the\@envbody\@nx\end{\@currenvir}}%
  \@envbody\emptytoks \def\begin@stack{b}%
  \begingroup
  \@xp\let\csname\@currenvir\endcsname\long@collect@@body
  \edef\process@envbody{\@xp\@nx\csname\@currenvir\endcsname}%
  \process@envbody
}
```

`\long@addto@envbody` Adapted from 's `\addto@envbody`

```
\long\def\long@addto@envbody#1{%
  \toks@{#1}%
  \edef\@dtl@tmp{\the\@envbody\the\toks@}%
  \global\@envbody\@xp{\@dtl@tmp}%
}
```

`\long@collect@@body` Adapted from 's `\collect@body`

```
\long\def\long@collect@@body#1\end#2{%
  \protected@edef\begin@stack{%
    \long@push@begins#1\begin\end \@xp\@gobble\begin@stack
  }%
  \ifx\@empty\begin@stack
    \endgroup
    \@checkend{#2}%
    \long@addto@envbody{#1}%
  \else
    \long@addto@envbody{#1\end{#2}}%
  \fi
  \process@envbody
}
```

`\long@push@begins` Adapted from 's `\push@begins`

```
\long\def\long@push@begins#1\begin#2{%
  \ifx\end#2\else b\@xp\long@push@begins\fi
}
```

1.2.1 General List Utilities

`\DTLifinlist` `\DTLifinlist{<element>}{<list>}{<true part>}{<false part>}`

If *<element>* is contained in the comma-separated list given by *<list>*, then do *<true part>* otherwise do false part. (Does a one level expansion on *<list>*, but no expansion on *<element>*.)

```

\newcommand*{\DTLifinlist}[4]{%
  \def\@dtl@doifinlist##1,#1,##2\end@dtl@doifinlist{%
    \def\@before{##1}%
    \def\@after{##2}%
  }%
  \expandafter\@dtl@doifinlist\expandafter,#2,#1,\@nil
  \end@dtl@doifinlist
  \ifx\@after\@nnil
% not found
    #4%
  \else
% found
    #3%
  \fi
}

```

`\DTLnumitemsinlist` `\DTLnumitemsinlist{<list>}{<cmd>}`

Counts number of non-empty elements in list and stores result in control sequence `<cmd>`.

```

\newcommand*{\DTLnumitemsinlist}[2]{%
  \@dtl@tmpcount=0\relax
  \@for\@dtl@element:=#1\do{%
    \ifdefempty{\@dtl@element}%
      {}%
    {\advance\@dtl@tmpcount by 1\relax}%
  }%
  \edef#2{\number\@dtl@tmpcount}%
}

```

`\dtl@choplast` `\dtl@choplast{<list>}{<rest>}{<last>}`

Chops the last element off a comma separated list, putting the last element in the control sequence `<last>` and putting the rest in the control sequence `<rest>`. The control sequence `<list>` is unchanged. If the list is empty, both `<last>` and `<rest>` will be empty.

```

\newcommand*{\dtl@choplast}[3]{%
Set <rest> to empty:
  \let#2\@empty
Set <last> to empty:
  \let#3\@empty
Iterate through <list>:
  \@for\@dtl@element:=#1\do{%
    \ifdefempty{#3}%
      {%

```


First iteration, don't set $\langle rest \rangle$.

```
}%
{%
  \ifdefempty{#2}%
  {%
```

Second iteration, set $\langle rest \rangle$ to $\langle last \rangle$ (which is currently set to the previous value:

```
    \expandafter\toks@\expandafter{#3}%
    \edef#2{\the\toks@}%
  }%
}%
```

Subsequent iterations, set $\langle rest \rangle$ to $\langle rest \rangle, \langle last \rangle$ ($\langle last \rangle$ is currently set to the previous value):

```
    \expandafter\toks@\expandafter{#3}%
    \expandafter\@dtl@toks\expandafter{#2}%
    \edef#2{\the\@dtl@toks,\the\toks@}%
  }%
}%
```

Now set $\langle last \rangle$ to current element.

```
    \let#3=\@dtl@element%
  }%
}
```

$\backslash dtl@chopfirst$ $\backslash dtl@chopfirst\{\langle list \rangle\}\{\langle first \rangle\}\{\langle rest \rangle\}$

Chops first element off $\langle list \rangle$ and store in $\langle first \rangle$. The remainder of the list is stored in $\langle rest \rangle$. ($\langle list \rangle$ remains unchanged.)

```
\newcommand*\dtl@chopfirst}[3]{%
  \let#2=\@empty
  \let#3=\@empty
  \@for\@dtl@element:=#1\do{%
    \let#2=\@dtl@element
  }%
  \if@endfor
    \let#3=\@forremainder
  \fi
  \@endforfalse
}
```

$\backslash dtl@sortlist$ $\backslash dtl@sortlist\{\langle list \rangle\}\{\langle criteria\ cmd \rangle\}$

Performs an insertion sort on $\langle list \rangle$, where $\langle criteria\ cmd \rangle$ is a macro which takes two arguments $\langle a \rangle$ and $\langle b \rangle$. $\langle criteria\ cmd \rangle$ must set the count register

\dtl@sortresult to either -1 ($\langle a \rangle$ less than $\langle b \rangle$), 0 ($\langle a \rangle$ is equal to $\langle b \rangle$) or 1 ($\langle a \rangle$ is greater than $\langle b \rangle$.)

```
\newcommand{\dtl@sortlist}[2]{%
\def\@dtl@sortedlist{}%
\@for\@dtl@currentrow:=#1\do{%
\expandafter\dtl@insertinto\expandafter
{\@dtl@currentrow}\@dtl@sortedlist}{#2}%
\@endforfalse}%
\let#1=\@dtl@sortedlist
}
```

\dtl@insertinto `\dtl@insertinto{ $\langle element \rangle$ }{ $\langle sorted-list \rangle$ }{ $\langle criteria cmd \rangle$ }`

Inserts $\langle element \rangle$ into the sorted list $\langle sorted-list \rangle$ according to the criteria given by $\langle criteria cmd \rangle$ (see above.)

```
\newcommand{\dtl@insertinto}[3]{%
\def\@dtl@newsortedlist{}%
\@dtl@insertdonefalse
\@for\dtl@srtelement:=#2\do{%
\if@dtl@insertdone
\expandafter\toks@\expandafter{\dtl@srtelement}%
\edef\@dtl@newstuff{\the\toks@}%
\else
\expandafter#3\expandafter{\dtl@srtelement}{#1}%
\ifnum\dtl@sortresult<0\relax
\expandafter\toks@\expandafter{\dtl@srtelement}%
\@dtl@toks{#1}%
\edef\@dtl@newstuff{\the\@dtl@toks},{\the\toks@}%
\@dtl@insertdonetrue
\else
\expandafter\toks@\expandafter{\dtl@srtelement}%
\edef\@dtl@newstuff{\the\toks@}%
\fi
\fi
\ifdefempty{\@dtl@newsortedlist}%
{%
\expandafter\toks@\expandafter{\@dtl@newstuff}%
\edef\@dtl@newsortedlist{\the\toks@}%
}%
{%
\expandafter\toks@\expandafter{\@dtl@newsortedlist}%
\expandafter\@dtl@toks\expandafter{\@dtl@newstuff}%
\edef\@dtl@newsortedlist{\the\toks@,\the\@dtl@toks}%
}%
\@endforfalse
}%
\ifdefempty{\@dtl@newsortedlist}%
```

```

{
  \@dtl@toks{#1}%
  \edef\@dtl@newsortedlist{\the\@dtl@toks}%
}%
{
  \if@dtl@insertdone
  \else
    \expandafter\toks@\expandafter{\@dtl@newsortedlist}%
    \@dtl@toks{#1}%
    \edef\@dtl@newsortedlist{\the\toks@,\the\@dtl@toks}%
  \fi
}%
\global\let#2=\@dtl@newsortedlist
}

```

`\if@dtl@insertdone` Define conditional to indicate whether the new entry has been inserted into the sorted list.

```
\newif\if@dtl@insertdone
```

`\dtl@sortresult` Define `\dtl@sortresult` to be set by comparison macro.

```
\newcount\dtl@sortresult
```

1.2.2 General Token Utilities

`\toks@gput@right@cx` `\toks@gput@right@cx{<toks name>}{<stuff>}`

Globally appends stuff to token register `\<toks name>`

```

\newcommand{\toks@gput@right@cx}[2]{%
  \def\@toks@name{#1}%
  \edef\@dtl@stuff{#2}%
  \global\csname\@toks@name\endcsname\expandafter
  \expandafter\expandafter{\expandafter\the
  \csname\expandafter\@toks@name\expandafter\endcsname\@dtl@stuff}%
}

```

`\toks@gconcat@middle@cx` `\toks@gconcat@middle@cx{<toks name>}{<before toks>}{<stuff>}{<after toks>}`

Globally sets token register `\<toks name>` to the contents of `<before toks>` concatenated with `<stuff>` (expanded) and the contents of `<after toks>`

```

\newcommand{\toks@gconcat@middle@cx}[4]{%
  \def\@toks@name{#1}%
  \edef\@dtl@stuff{#3}%
  \global\csname\@toks@name\endcsname\expandafter\expandafter
  \expandafter\expandafter\expandafter
  \expandafter\expandafter{\expandafter\expandafter\expandafter

```

```

\the\expandafter\expandafter\expandafter#2%
\expandafter\@dtl@stuff\the#4}%
}

```

1.3 Locale Dependent Information

`@dtl@numgrpsepcount` Define count register to count the digits between the number group separators.
`\newcount\@dtl@numgrpsepcount`

`\@dtl@decimal` The current decimal character is stored in `\@dtl@decimal`.
`\newcommand*\@dtl@decimal}{.}`

`@dtl@numbergroupchar` The current number group character is stored in `\@dtl@numbergroupchar`.
`\newcommand*\@dtl@numbergroupchar}{,}`

`\DTLsetnumberchars` `\DTLsetnumberchars{<number group char>}{<decimal char>}`

This sets the decimal character and number group characters.

```

\newcommand*\DTLsetnumberchars}[2]{%
  \renewcommand*\@dtl@numbergroupchar{#1}%
  \renewcommand*\@dtl@decimal{#2}%
  \@dtl@construct@getnums
  \@dtl@construct@stripnumgrpchar{#1}%
}

```

`@construct@getintfrac` `\@dtl@construct@getintfrac{<char>}`

This constructs the macros for extracting integer and fractional parts from a real number using the decimal character `<char>`.

`DTLconverttodecimal` `\DTLconverttodecimal{<num>}{<cmd>}`

`\DTLconverttodecimal` will convert locale dependent `<num>` a decimal number in a form that can be used in the macros defined in the `fp` package. The resulting number is stored in `<cmd>`. This command has to be redefined whenever the decimal and number group characters are changed as they form part of the command definitions.

```

\edef\@dtl@construct@getintfrac#1{%
  \noexpand\def\noexpand\@dtl@getintfrac##1#1##2\noexpand\relax{%
    \noexpand\@dtl@get@intpart{##1}%
    \noexpand\def\noexpand\@dtl@fracpart{##2}%
    \noexpand\ifx\noexpand\@empty\noexpand\@dtl@fracpart
      \noexpand\def\noexpand\@dtl@fracpart{0}%
    \noexpand\else

```

```

\dtl@getfracpart##2\relax
\dtl@choptrailingzeroes{\dtl@fracpart}%
\fi
}%
\def\dtl@getfracpart##1#1\relax{%
\def\dtl@fracpart{##1}%
}%
\def\DTLconverttodecimal##1##2{%
\dtl@ifsingle{##1}%
{%
\expandafter\dtl@toks@\expandafter{##1}%
\edef\dtl@tmp{\the\dtl@toks}%
}%
{%
\def\dtl@tmp{##1}%
}%
\dtl@standardize@currency\dtl@tmp
\ifempty{\dtl@org@currency}%
{%
}%
{%
\let\dtl@currency\dtl@org@currency
}%
\expandafter
\dtl@getintfrac\dtl@tmp#1\relax
\edef##2{\dtl@intpart.\dtl@fracpart}%
}%
}

```

`\dtl@construct@getnums` The following calls the above with the relevant decimal character:

```

\newcommand*\dtl@construct@getnums{%
\expandafter\dtl@construct@getintfrac\expandafter{\dtl@decimal}%
}

```

`\dtl@get@intpart` The following gets the integer part (adjusting for repeating +/- signs if necessary.) Sets `\dtl@intpart`.

```

\newcommand*\dtl@get@intpart[1]{%
\dtl@tmpcount=1\relax
\def\dtl@intpart{#1}%
\ifx\dtl@intpart\empty
\def\dtl@intpart{0}%
\else
\def\dtl@intpart{%
\dtl@get@int@part#1.\relax%
}%
\fi
\ifnum\dtl@tmpcount<0\relax
\edef\dtl@intpart{-\dtl@intpart}%
\fi
\dtl@strip@numgrpchar{\dtl@intpart}%
}

```

}

\@dtl@get@int@part

```
\def\@dtl@get@int@part#1#2\relax{%
  \def\@dtl@argi{#1}%
  \def\@dtl@argii{#2}%
  \ifx\protect#1\relax%
    \let\@dtl@get@nextintpart=\@dtl@get@int@part
  \else
    \expandafter\ifx\@dtl@argi$%
      \let\@dtl@get@nextintpart=\@dtl@get@int@part
    \else
      \ifx-#1%
        \multiply\@dtl@tmpcount by -1\relax
        \let\@dtl@get@nextintpart=\@dtl@get@int@part
      \else
        \if\@dtl@argi+%
          \let\@dtl@get@nextintpart=\@dtl@get@int@part
        \else
          \def\@dtl@intpart{#1}%
          \ifx.\@dtl@argii
            \let\@dtl@get@nextintpart=\@gobble
          \else
            \let\@dtl@get@nextintpart=\@dtl@get@next@intpart
          \fi
        \fi
      \fi
    \fi
  \fi
  \@dtl@get@nextintpart#2\relax
}
```

\@dtl@get@next@intpart

```
\def\@dtl@get@next@intpart#1.\relax{%
  \edef\@dtl@intpart{\@dtl@intpart#1}%
}
```

\@dtl@choptrailingzeroes

\@dtl@choptrailingzeroes{<cmd>}

Chops trailing zeroes from number given by <cmd>.

```
\newcommand*\@dtl@choptrailingzeroes}[1]{%
  \def\@dtl@tmpcpz{}%
  \expandafter\@dtl@chop@trailingzeroes#1\@nil%
  \let#1=\@dtl@tmpcpz
}
```

\@dtl@chop@trailingzeroes

Trailing zeroes are chopped using a recursive algorithm. \@dtl@tmpcpz needs

to be set before using this. (The chopped number is put in this control sequence.)

```
\def\@dtl@chop@trailingzeroes#1#2\@nil{%
  \dtlifnumeq{#2}{0}%
  {%
    \edef\@dtl@tmpcpz{\@dtl@tmpcpz#1}%
    \let\@dtl@chopzeroesnext=\@dtl@gobbletonil
  }%
  {%
    \edef\@dtl@tmpcpz{\@dtl@tmpcpz#1}%
    \let\@dtl@chopzeroesnext=\@dtl@chop@trailingzeroes
  }%
  \@dtl@chopzeroesnext#2\@nil
}
```

No-op macro to end recursion:

```
\@dtl@gobbletonil
```

```
\def\@dtl@gobbletonil#1\@nil{}
```

```
\dtl@truncatedecimal
```

```
\dtl@truncatedecimal<cmd>
```

Truncates decimal given by *<cmd>* to an integer (assumes the number is in decimal format with full stop as decimal point.)

```
\newcommand*\@dtl@truncatedecimal}[1]{%
  \expandafter\@dtl@truncatedecimal#1.\@nil#1%
}
```

```
\dtl@truncatedecimal
```

```
\def\@dtl@truncatedecimal#1.#2\@nil#3{%
  \def#3{#1}%
}
```

```
\dtl@strip@numgrpchar
```

```
\@dtl@strip@numgrpchar{<cmd>}
```

Strip the number group character from the number given by *<cmd>*.

```
\newcommand*\@dtl@strip@numgrpchar}[1]{%
  \def\@dtl@stripped{}%
  \edef\@dtl@do@stripnumgrpchar{%
    \noexpand\@dtl@strip@numgrpchar#1\@dtl@numbergroupchar
    \noexpand\relax
  }%
  \@dtl@do@stripnumgrpchar
  \let#1=\@dtl@stripped
}
```

uct@stripnumgrpchar The following macro constructs \@@dtl@strip@numgrpchar.

```
\edef\@dtl@construct@stripnumgrpchar#1{%
  \noexpand\def\noexpand\@@dtl@strip@numgrpchar##1#1##2\noexpand\relax{%
    \noexpand\expandafter\noexpand\toks@\noexpand\expandafter
      {\noexpand\@dtl@stripped}%
    \noexpand\edef\noexpand\@dtl@stripped{%
      \noexpand\the\noexpand\toks@
        ##1%
      }%
    \noexpand\def\noexpand\@dtl@tmp{##2}%
    \noexpand\ifx\noexpand\@dtl@tmp\noexpand\@empty
      \noexpand\let\noexpand\@dtl@next=\noexpand\relax
    \noexpand\else
      \noexpand\let\noexpand\@dtl@next=\noexpand\@@dtl@strip@numgrpchar
    \noexpand\fi
    \noexpand\@dtl@next##2\noexpand\relax
  }%
}
```

\DTLdecimaltolocale \DTLdecimaltolocale{<number>}{<cmd>}

Define command to convert a decimal number into the locale dependent format. Stores result in <cmd> which must be a control sequence.

```
\newcommand*\@DTLdecimaltolocale}[2]{%
  \edef\@dtl@tmpdtl{#1}%
  \expandafter\@dtl@decimaltolocale\@dtl@tmpdtl.\relax
  \dtlifnumeq{\@dtl@fracpart}{0}%
  {%
    \edef#2{\@dtl@intpart}%
  }%
  {%
    \edef#2{\@dtl@intpart\@dtl@decimal\@dtl@fracpart}%
  }%
}
```

dtl@decimaltolocale Convert the integer part (store in \@dtl@intpart)

```
\def\@dtl@decimaltolocale#1.#2\relax{%
  \@dtl@decimaltolocaleint{#1}%
  \def\@dtl@fracpart{#2}%
  \ifx\@dtl@fracpart\@empty
    \def\@dtl@fracpart{0}%
  \else
    \@dtl@decimaltolocalefrac#2\relax
  \fi
}
```

@decimaltolocaleint


```

\def\@dtl@decimaltolocaleint#1{%
  \@dtl@tmpcount=0\relax
  \@dtl@countdigits#1.\relax
  \@dtl@numgrpsepcount=\@dtl@tmpcount\relax
  \divide\@dtl@numgrpsepcount by 3\relax
  \multiply\@dtl@numgrpsepcount by 3\relax
  \advance\@dtl@numgrpsepcount by -\@dtl@tmpcount\relax
  \ifnum\@dtl@numgrpsepcount<0\relax
    \advance\@dtl@numgrpsepcount by 3\relax
  \fi
  \def\@dtl@intpart{}%
  \@dtl@decimal@to@localeint#1.\relax
}

```

\@dtl@countdigits Counts the number of digits until #2 is a full stop. (increments \@dtl@tmpcount.)

```

\def\@dtl@countdigits#1#2\relax{%
  \advance\@dtl@tmpcount by 1\relax
  \ifx.#2\relax
    \let\@dtl@countnext=\@gobble
  \else
    \let\@dtl@countnext=\@dtl@countdigits
  \fi
  \@dtl@countnext#2\relax
}

```

decimal@to@localeint

```

\def\@dtl@decimal@to@localeint#1#2\relax{%
  \advance\@dtl@numgrpsepcount by 1\relax
  \ifx.#2\relax
    \edef\@dtl@intpart{\@dtl@intpart#1}%
    \let\@dtl@localeintnext=\@gobble
  \else
    \ifnum\@dtl@numgrpsepcount=3\relax
      \edef\@dtl@intpart{\@dtl@intpart#1\@dtl@numbergroupchar}%
      \@dtl@numgrpsepcount=0\relax
    \else
      \ifnum\@dtl@numgrpsepcount>3\relax
        \@dtl@numgrpsepcount=0\relax
      \fi
      \edef\@dtl@intpart{\@dtl@intpart#1}%
    \fi
    \let\@dtl@localeintnext=\@dtl@decimal@to@localeint
  \fi
  \@dtl@localeintnext#2\relax
}

```

decimaltolocalefrac Convert the fractional part (store in \@dtl@fracpart)

```

% \end{macrocode}
\def\@dtl@decimaltolocalefrac#1.\relax{%

```

```

\def\@dtl@fracpart{#1}%
\@dtl@choptrailingzeroes{\@dtl@fracpart}%
}
%\end{macro}
%
%\begin{macro}{\DTLdecimaltocurrency}
%\begin{definition}
% \cs{DTLdecimaltocurrency}\marg{number}\marg{cmd}
%\end{definition}
% This converts a decimal number into the locale
% dependent currency format. Stores result in \meta{cmd} which must be
% a control sequence.
% \begin{macrocode}
\newcommand*{\DTLdecimaltocurrency}[2]{%
\edef\@dtl@tmpdtl{#1}%
\expandafter\@dtl@decimaltolocale\@dtl@tmpdtl.\relax
\dtl@truncatedecimal\@dtl@tmpdtl
\@dtl@tmpcount=\@dtl@tmpdtl\relax
\expandafter\@dtl@toks\expandafter{\@dtl@currency}%
\dtl@ifnumeq{\@dtl@fracpart}{0}%
{%
\ifnum\@dtl@tmpcount<0\relax
\@dtl@tmpcount = -\@dtl@tmpcount\relax
\edef#2{-\the\@dtl@toks\the\@dtl@tmpcount\@dtl@decimal00}%
\else
\edef#2{\the\@dtl@toks\@dtl@intpart\@dtl@decimal00}%
\fi
}%
}%
}%
\ifnum\@dtl@tmpcount<0\relax
\@dtl@tmpcount = -\@dtl@tmpcount\relax
\ifnum\@dtl@fracpart<10\relax
\edef#2{%
-\the\@dtl@toks\number\@dtl@tmpcount
\@dtl@decimal\@dtl@fracpart0%
}%
\else
\edef#2{%
-\the\@dtl@toks\number\@dtl@tmpcount
\@dtl@decimal\@dtl@fracpart
}%
\fi
\else
\ifnum\@dtl@fracpart<10\relax
\edef#2{\the\@dtl@toks\@dtl@intpart\@dtl@decimal\@dtl@fracpart0}%
\else
\edef#2{\the\@dtl@toks\@dtl@intpart\@dtl@decimal\@dtl@fracpart}%
\fi
\fi
\fi

```

```
}%
}
```

Set the defaults:

```
\@dtl@construct@getnums
\expandafter\@dtl@construct@stripnumgrpchar\expandafter
{\@dtl@numbergroupchar}
```

1.3.1 Currencies

```
\@dtl@currencies \@dtl@currencies stores all known currencies.
\newcommand*\@dtl@currencies{\$, \pounds}
```

```
DTLnewcurrencysymbol \DTLaddcurrency{<symbol>}
```

Adds *<symbol>* to the list of known currencies

```
\newcommand*\@DTLnewcurrencysymbol[1]{%
\expandafter\toks@\expandafter{\@dtl@currencies}%
\@dtl@toks{#1}%
\edef\@dtl@currencies{\the\@dtl@toks,\the\toks@}%
}
```

If any of the following currency commands have been defined, add them to the list:

```
\AtBeginDocument{%
\@ifundefined{texteuro}{\@DTLnewcurrencysymbol{\texteuro}}%
\@ifundefined{textdollar}{\@DTLnewcurrencysymbol{\textdollar}}%
\@ifundefined{textstirling}{\@DTLnewcurrencysymbol{\textstirling}}%
\@ifundefined{textyen}{\@DTLnewcurrencysymbol{\textyen}}%
\@ifundefined{textwon}{\@DTLnewcurrencysymbol{\textwon}}%
\@ifundefined{textcurrency}{\@DTLnewcurrencysymbol{\textcurrency}}%
\@ifundefined{euro}{\@DTLnewcurrencysymbol{\euro}}%
\@ifundefined{yen}{\@DTLnewcurrencysymbol{\yen}}%
}
```

```
standardize@currency \@dtl@standardize@currency{<cmd>}
```

Substitutes the first currency symbol found in *<cmd>* with $\$$. This is used when testing text to determine if it is currency. The original currency symbol is stored in $\@dtl@org@currency$, so that it can be replaced later. If no currency symbol is found, $\@dtl@org@currency$ will be empty.

```
\newcommand*\@dtl@standardize@currency[1]{%
\def\@dtl@org@currency{}%
\@for\@dtl@thiscurrency:=\@dtl@currencies\do{%
\expandafter\toks@\expandafter{\@dtl@thiscurrency}%
}
```

```

\edef\@dtl@dosubs{\noexpand\DTLsubstitute{\noexpand#1}%
  {\the\toks@}{\noexpand\$}}%
\@dtl@dosubs
\ifdefempty{\@dtl@replaced}%
{%
}%
{%
  \let\@dtl@org@currency=\@dtl@replaced
  \@endfortrue
}%
}%
\@endforfalse
}

```

\@dtl@currency \@dtl@currency is set by \DTLlocaltodecimal and \@dtl@checknumerical.
 It is used by \DTLdecimaltocurrency. Set to \\$ by default.
 \newcommand*{\@dtl@currency}{\\$}

\DTLsetdefaultcurrency \DTLsetdefaultcurrency{<symbol>} sets the default currency.
 \newcommand*{\DTLsetdefaultcurrency}[1]{%
 \renewcommand*{\@dtl@currency}{#1}%
 }

1.4 Floating Point Arithmetic

The commands defined in this section all use the equivalent commands provided by the fp or pgfmath packages, but first convert the decimal number into the required format.

\DTLadd \DTLadd{<cmd>}{<num1>}{<num2>}

Sets $\langle cmd \rangle = \langle num1 \rangle + \langle num2 \rangle$

```

\newcommand*{\DTLadd}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \dtladd{\@dtl@tmp}{\@dtl@numi}{\@dtl@numii}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}

```

\DTLgadd Global version

```

\newcommand*\DTLgadd}[3]{%
  \DTLadd{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}

```

\DTLaddall \DTLaddall{<cmd>}{<num list>}

Sums all the values in <num list> and stores in <cmd> which must be a control sequence.

```

\newcommand*\DTLaddall}[2]{%
  \def\@dtl@sum{0}%
  \@for\dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\dtl@thisval}{\@dtl@num}%
    \dtladd{\@dtl@sum}{\@dtl@sum}{\@dtl@num}%
  }%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@sum}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@sum}{#1}%
  }%
}

```

\DTLgaddall \DTLgaddall{<cmd>}{<num list>}

Global version

```

\newcommand*\DTLgaddall}[2]{%
  \DTLaddall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}

```

\DTLsub \DTLsub{<cmd>}{<num1>}{<num2>}

Sets <cmd> = <num1> - <num2>

```

\newcommand*\DTLsub}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \dtlsub{\@dtl@tmp}{\@dtl@numi}{\@dtl@numii}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}

```

```
}%
}
```

\DTLgsub Global version

```
\newcommand*{\DTLgsub}[3]{%
  \DTLsub{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLmul `\DTLmul{<cmd>}{<num1>}{<num2>}`

Sets $\langle cmd \rangle = \langle num1 \rangle \times \langle num2 \rangle$

```
\newcommand*{\DTLmul}[3]{%
  \let\@dtl@thisreplaced=\@empty
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \ifdefempty{\@dtl@replaced}%
  {%
  }%
  {%
    \let\@dtl@thisreplaced=\@dtl@replaced
  }%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \ifdefempty{\@dtl@replaced}%
  {%
  }%
  {%
    \let\@dtl@thisreplaced=\@dtl@replaced
  }%
  \dtlmul{\@dtl@tmp}{\@dtl@numi}{\@dtl@numii}%
  \ifdefempty{\@dtl@thisreplaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}
```

\DTLgmul Global version

```
\newcommand*{\DTLgmul}[3]{%
  \DTLmul{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLdiv `\DTLdiv{<cmd>}{<num1>}{<num2>}`

Sets $\langle cmd \rangle = \langle num1 \rangle / \langle num2 \rangle$

```
\newcommand*{\DTLdiv}[3]{%
  \let\@dtl@thisreplaced=\@empty
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \ifdefempty{\@dtl@replaced}%
  {%
  }%
  {%
    \let\@dtl@thisreplaced=\@dtl@replaced
  }%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \dtldiv{\@dtl@tmp}{\@dtl@numi}{\@dtl@numii}%
  \ifdefempty{\@dtl@thisreplaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \ifdefequal{\@dtl@thisreplaced}{\@dtl@replaced}%
    {%
      \DTLdecimaltolocale{\@dtl@tmp}{#1}%
    }%
    {%
      \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
    }%
  }%
}
```

\DTLgdiv Global version

```
\newcommand*{\DTLgdiv}[3]{%
  \DTLdiv{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLabs $\langle cmd \rangle$ $\{\langle num \rangle\}$

Sets $\langle cmd \rangle = \text{abs}(\langle num \rangle)$

```
\newcommand*{\DTLabs}[2]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \dtlabs{\@dtl@tmp}{\@dtl@numi}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}
```

\DTLgabs Global version

```
\newcommand*{\DTLgabs}[2]{%
  \DTLabs{\@dtl@tmpii}{#2}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLneg \DTLneg{<cmd>}{<num>}

Sets <cmd> = -<num>

```
\newcommand*{\DTLneg}[2]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \dtlneg{\@dtl@tmp}{\@dtl@numi}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}
```

\DTLgneg Global version

```
\newcommand*{\DTLgneg}[2]{%
  \DTLneg{\@dtl@tmpii}{#2}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLsqr \DTLsqr{<cmd>}{<num>}

Sets <cmd> = sqrt(<num>)

```
\newcommand*{\DTLsqr}[2]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \dtlroot{\@dtl@tmpi}{\@dtl@numi}{2}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmpi}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmpi}{#1}%
  }%
}
```

\DTLgsqr Global version

```
\newcommand*{\DTLgsqr}[2]{%
  \DTLsqr{\@dtl@tmpii}{#2}%
  \global\let#1=\@dtl@tmpii
}
```


}

\DTLmin \DTLmin{<cmd>}{<num1>}{<num2>}

Sets <cmd> = min(<num1>, <num2>)

```
\newcommand*{\DTLmin}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \dtlifnumlt{\@dtl@numi}{\@dtl@numii}%
  {%
    \dtl@ifsingle{#2}%
    {\let#1=#2}%
    {\def#1{#2}}%
  }%
  {%
    \dtl@ifsingle{#3}%
    {\let#1=#3}%
    {\def#1{#3}}%
  }%
}
```

\DTLgmin Global version

```
\newcommand*{\DTLgmin}[3]{%
  \DTLmin{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}
```

\DTLminall \DTLminall{<cmd>}{<num list>}

Finds the minimum value in <num list> and stores in <cmd> which must be a control sequence.

```
\newcommand*{\DTLminall}[2]{%
  \let\@dtl@min=\@empty
  \@for\dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\dtl@thisval}{\@dtl@num}%
    \ifdefempty{\@dtl@min}%
    {%
      \let\@dtl@min=\@dtl@num
    }%
    {%
      \dtlmin{\@dtl@min}{\@dtl@min}{\@dtl@num}%
    }%
  }%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@min}{#1}%
  }
```

```

}%
{%
  \DTLdecimaltocurrency{\@dtl@min}{#1}%
}%
}

```

`\DTLgminall` `\DTLgminall{<cmd>}{<num list>}`

Global version

```

\newcommand*{\DTLgminall}[2]{%
  \DTLminall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}

```

`\DTLmax` `\DTLmax{<cmd>}{<num1>}{<num2>}`

Sets $\langle cmd \rangle = \max(\langle num1 \rangle, \langle num2 \rangle)$

```

\newcommand*{\DTLmax}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \DTLconverttodecimal{#3}{\@dtl@numii}%
  \dtlmax{\@dtl@tmp}{\@dtl@numi}{\@dtl@numii}%
  \dtlifnumgt{\@dtl@numi}{\@dtl@numii}%
  {%
    \dtl@ifsingle{#2}%
    {\let#1=#2}%
    {\def#1{#2}}%
  }%
  {%
    \dtl@ifsingle{#3}%
    {\let#1=#3}%
    {\def#1{#3}}%
  }%
}

```

`\DTLgmax` Global version

```

\newcommand*{\DTLgmax}[3]{%
  \DTLmax{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}

```

`\DTLmaxall` `\DTLmaxall{<cmd>}{<num list>}`

Finds the maximum value in $\langle num list \rangle$ and stores in $\langle cmd \rangle$ which must be a control sequence.

```

\newcommand*{\DTLmaxall}[2]{%
  \let\@dtl@max=\@empty
  \@for\dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\dtl@thisval}{\@dtl@num}%
    \ifdefempty{\@dtl@max}%
    {%
      \let\@dtl@max\@dtl@num
    }%
    {%
      \dtlmax{\@dtl@max}{\@dtl@max}{\@dtl@num}%
    }%
  }%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@max}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@max}{#1}%
  }%
}

```

\DTLgmaxall \DTLgmaxall{<cmd>}{<num list>}

Global version

```

\newcommand*{\DTLgmaxall}[2]{%
  \DTLmaxall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}

```

\DTLmeanforall \DTLmeanforall{<cmd>}{<num list>}

Computes the arithmetic mean of all the values in <num list> and stores in <cmd> which must be a control sequence.

```

\newcommand*{\DTLmeanforall}[2]{%
  \def\@dtl@mean{0}%
  \def\@dtl@n{0}%
  \@for\dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\dtl@thisval}{\@dtl@num}%
    \dtladd{\@dtl@mean}{\@dtl@mean}{\@dtl@num}%
    \dtladd{\@dtl@n}{\@dtl@n}{1}%
  }%
  \dtldiv{\@dtl@mean}{\@dtl@mean}{\@dtl@n}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@mean}{#1}%
  }%
}

```

```
{%
  \DTLdecimaltocurrency{\@dtl@mean}{#1}%
}%
}
```

`\DTLgmeanforall` `\DTLgmeanforall{<cmd>}{<num list>}`

Global version

```
\newcommand*{\DTLgmeanforall}[2]{%
  \DTLmeanforall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}
```

`\DTLvarianceforall` `\DTLvarianceforall{<cmd>}{<num list>}`

Computes the variance of all the values in `<num list>` and stores in `<cmd>` which must be a control sequence.

```
\newcommand*{\DTLvarianceforall}[2]{%
  \def\@dtl@mean{0}%
  \def\@dtl@n{0}%
  \let\@dtl@decvals=\@empty
  \@for\@dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\@dtl@thisval}{\@dtl@num}%
    \ifdefempty{\@dtl@decvals}%
      {%
        \let\@dtl@decvals=\@dtl@num
      }%
      {%
        \expandafter\toks@\expandafter{\@dtl@decvals}%
        \edef\@dtl@decvals{\the\toks@,\@dtl@num}%
      }%
      \dtladd{\@dtl@mean}{\@dtl@mean}{\@dtl@num}%
      \dtladd{\@dtl@n}{\@dtl@n}{1}%
    }%
    \dtldiv{\@dtl@mean}{\@dtl@mean}{\@dtl@n}%
  \def\@dtl@var{0}%
  \@for\@dtl@num:=\@dtl@decvals\do{%
    \dtlsub{\@dtl@diff}{\@dtl@num}{\@dtl@mean}%
    \dtlmul{\@dtl@diff}{\@dtl@diff}{\@dtl@diff}%
    \dtladd{\@dtl@var}{\@dtl@var}{\@dtl@diff}%
  }%
  \dtldiv{\@dtl@var}{\@dtl@var}{\@dtl@n}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@var}{#1}%
  }%
```

```
{%
  \DTLdecimaltocurrency{\@dtl@var}{#1}%
}%
}
```

`\DTLgvarianceforall` `\DTLgvarianceforall{<cmd>}{<num list>}`

Global version

```
\newcommand*{\DTLgvarianceforall}[2]{%
  \DTLvvarianceforall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}
```

`\DTLsdforall` `\DTLsdforall{<cmd>}{<num list>}`

Computes the standard deviation of all the values in *<num list>* and stores in *<cmd>* which must be a control sequence.

```
\newcommand*{\DTLsdforall}[2]{%
  \def\@dtl@mean{0}%
  \def\@dtl@n{0}%
  \let\@dtl@decvals=\@empty
  \@for\@dtl@thisval:=#2\do{%
    \expandafter\DTLconverttodecimal\expandafter{\@dtl@thisval}{\@dtl@num}%
    \ifdefempty{\@dtl@decvals}%
      {%
        \let\@dtl@decvals=\@dtl@num
      }%
    {%
      \expandafter\toks@\expandafter{\@dtl@decvals}%
      \edef\@dtl@decvals{\the\toks@,\@dtl@num}%
    }%
    \dtladd{\@dtl@mean}{\@dtl@mean}{\@dtl@num}%
    \dtladd{\@dtl@n}{\@dtl@n}{1}%
  }%
  \dtldiv{\@dtl@mean}{\@dtl@mean}{\@dtl@n}%
  \def\@dtl@sd{0}%
  \@for\@dtl@num:=\@dtl@decvals\do{%
    \dtlsub{\@dtl@diff}{\@dtl@num}{\@dtl@mean}%
    \dtlmul{\@dtl@diff}{\@dtl@diff}{\@dtl@diff}%
    \dtladd{\@dtl@sd}{\@dtl@sd}{\@dtl@diff}%
  }%
  \dtldiv{\@dtl@sd}{\@dtl@sd}{\@dtl@n}%
  \dtlroot{\@dtl@sd}{\@dtl@sd}{2}%
  \ifdefempty{\@dtl@replaced}%
    {%
      \DTLdecimaltolocale{\@dtl@sd}{#1}%
    }
```

```

}%
{%
  \DTLdecimaltocurrency{\@dtl@sd}{#1}%
}%
}

```

`\DTLgsdforall` `\DTLgsdforall{<cmd>}{<num list>}`

Global version

```

\newcommand*{\DTLgsdforall}[2]{%
  \DTLsdfforall{\@dtl@tmpi}{#2}%
  \global\let#1=\@dtl@tmpi
}

```

`\DTLround` `\DTLround{<cmd>}{<num>}{<num digits>}`

Sets *<cmd>* to *<num>* rounded to *<num digits>* digits after the decimal character.

```

\newcommand*{\DTLround}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \dtlround{\@dtl@tmp}{\@dtl@numi}{#3}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \DTLdecimaltolocale{\@dtl@tmp}{#1}%
  }%
  {%
    \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
  }%
}

```

`\DTLground` Global version

```

\newcommand*{\DTLground}[3]{%
  \DTLround{\@dtl@tmpii}{#2}{#3}%
  \global\let#1=\@dtl@tmpii
}

```

`\DTLtrunc` `\DTLtrunc{<cmd>}{<num>}{<num digits>}`

Sets *<cmd>* to *<num>* truncated to *<num digits>* digits after the decimal character.

```

\newcommand*{\DTLtrunc}[3]{%
  \DTLconverttodecimal{#2}{\@dtl@numi}%
  \dtltrunc{\@dtl@tmp}{\@dtl@numi}{#3}%
  \ifdefempty{\@dtl@replaced}%
  {%

```

```

        \DTLdecimaltolocale{\@dtl@tmp}{#1}%
    }%
    {%
        \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
    }%
}

```

\DTLgtrunc Global version

```

\newcommand*\DTLgtrunc[3]{%
    \DTLtrunc{\@dtl@tmpii}{#2}{#3}%
    \global\let#1=\@dtl@tmpii
}

```

\DTLclip \DTLclip{*<cmd>*}{*<num>*}

Sets *<cmd>* to *<num>* with all unnecessary 0's removed.

```

\newcommand*\DTLclip[2]{%
    \DTLconverttodecimal{#2}{\@dtl@numi}%
    \dtlclip{\@dtl@tmp}{\@dtl@numi}%
    \ifdefempty{\@dtl@replaced}%
    {%
        \DTLdecimaltolocale{\@dtl@tmp}{#1}%
    }%
    {%
        \DTLdecimaltocurrency{\@dtl@tmp}{#1}%
    }%
}

```

\DTLgclip Global version

```

\newcommand*\DTLgclip[3]{%
    \DTLclip{\@dtl@tmpii}{#2}%
    \global\let#1=\@dtl@tmpii
}

```

1.5 String Macros

\DTLinitials \DTLinitials{*<string>*}

Convert a string into initials. (Any ~ character found is first converted into a space.)

```

\newcommand*\DTLinitials[1]{%
    \def\dtl@initialscmd{%
        \dtl@subnobrsp{#1}{\dtl@string}%
        \DTLsubstituteall{\dtl@string}{~}{ }%
        \DTLsubstituteall{\dtl@string}{\ }{ }%
    }
}

```

```

\DTLsubstituteall{\dtl@string}{\space}{ }%
\expandafter\dtl@initials\dtl@string{} \@nil%
\dtl@initialscmd
}%

```

The following substitutes `\protect \nobreakspace {}` with a space. (Note that in this case the space following `\nobreakspace` forms part of the command.)

```

\edef\dtl@construct@subnobrsp{%
Define \@dtl@subnobrsp
  \noexpand\def\noexpand\@dtl@subnobrsp##1\noexpand\protect
  \expandafter\noexpand\csname nobreakspace \endcsname ##2{%
  \noexpand\toks@{##1}%
  \noexpand\expandafter\noexpand\@dtl@toks\noexpand\expandafter{%
  \noexpand\@dtl@string}%
  \noexpand\edef\noexpand\@dtl@string{\noexpand\the\noexpand\@dtl@toks
  \noexpand\the\noexpand\toks@}%
  \noexpand\def\noexpand\@dtl@tmp{##2}%
  \noexpand\ifx\noexpand\@dtl@tmp\noexpand\@nnil
    \noexpand\let\noexpand\@dtl@subnobrspnext=\noexpand\relax
  \noexpand\else
    \noexpand\toks@{ }%
    \noexpand\expandafter\noexpand\@dtl@toks\noexpand\expandafter{%
    \noexpand\@dtl@string}%
    \noexpand\edef\noexpand\@dtl@string{\noexpand\the\noexpand\@dtl@toks
    \noexpand\the\noexpand\toks@}%
    \noexpand\let\noexpand\@dtl@subnobrspnext=\noexpand\@dtl@subnobrsp
  \noexpand\fi
  \noexpand\@dtl@subnobrspnext
}%
Define \dtl@subnobrsp
  \noexpand\def\noexpand\dtl@subnobrsp##1##2{%
  \noexpand\def\noexpand\@dtl@string{%
  \noexpand\@dtl@subnobrsp ##1\noexpand\protect\expandafter\noexpand
  \csname nobreakspace \endcsname \noexpand\@nil
  \noexpand\let##2=\noexpand\@dtl@string
  }%
  }
\dtl@construct@subnobrsp

```

`\DTLstoreinitials` `\DTLstoreinitials{<string>}{<cmd>}`

Convert a string into initials and store in `<cmd>`. (Any `~` character found is first converted into a space.)

```

\newcommand*{\DTLstoreinitials}[2]{%
  \def\dtl@initialscmd{%

```



```

\dtl@subnobrsp{#1}{\dtl@string}%
\DTLsubstituteall{\dtl@string}{~}{ }%
\DTLsubstituteall{\dtl@string}{\ }{ }%
\DTLsubstituteall{\dtl@string}{\space}{ }%
\expandafter\dtl@initials\dtl@string{} \@nil
\let#2=\dtl@initialscmd
}

```

\dtl@initials

```

\def\dtl@initials#1#2 #3{%
  \dtl@ifsingle{#1}%
  {%
    \ifcat\noexpand#1\relax\relax
      \def\@dtl@donextinitials{\@dtl@initials#2 {#3}}%
    \else
      \def\@dtl@donextinitials{\@dtl@initials#1#2 {#3}}%
    \fi
  }%
  {%
    \def\@dtl@donextinitials{\@dtl@initials{#1}#2 {#3}}%
  }%
  \@dtl@donextinitials
}

```

\@dtl@initials

```

\def\@dtl@initials#1#2 #3{%
  \dtl@initialshyphen#2-{}\dtl@endhyp
  \expandafter\@dtl@toks\expandafter{\dtl@initialscmd}%
  \toks@{#1}%
  \ifdefempty{\dtl@inithyphen}%
  {%
  }%
  {%
    \edef\dtl@initialscmd{\the\@dtl@toks\the\toks@}%
    \expandafter\@dtl@toks\expandafter{\dtl@initialscmd}%
    \expandafter\toks@\expandafter{\dtl@inithyphen}%
  }%
  \def\dtl@tmp{#3}%
  \ifx\@nnil\dtl@tmp
    \edef\dtl@initialscmd{\the\@dtl@toks\the\toks@\DTLafterinitials}%
    \let\dtl@initialsnext=\@gobble
  \else
    \edef\dtl@initialscmd{\the\@dtl@toks\the\toks@\DTLbetweeninitials}%
    \let\dtl@initialsnext=\dtl@initials
  \fi
  \dtl@initialsnext{#3}%
}

```

\dtl@initialshyphen

```

\def\dtl@initialshyphen#1-#2#3\dtl@endhyp{%
  \def\dtl@inithyphen{#2}%
  \ifdefempty{\dtl@inithyphen}%
  {%
  }%
  {%
  \edef\dtl@inithyphen{%
    \DTLafterinitialbeforehyphen\DTLinitialhyphen#2}%
  }%
}

```

`\DTLafterinitials` Defines what to do after the final initial.

```
\newcommand*{\DTLafterinitials}{.}
```

`\DTLbetweeninitials` Defines what to do between initials.

```
\newcommand*{\DTLbetweeninitials}{.}
```

`\DTLinitialbeforehyphen` Defines what to do before a hyphen.

```
\newcommand*{\DTLafterinitialbeforehyphen}{.}
```

`\DTLinitialhyphen` Defines what to do at the hyphen

```
\newcommand*{\DTLinitialhyphen}{-}
```

`\DTLifAllUpperCase` `\DTLifAllUpperCase{<string>}{<true part>}{<>false part>}`

If `<string>` only contains uppercase characters do `<true part>`, otherwise do `<>false part>`.

```

\newcommand*{\DTLifAllUpperCase}[3]{%
  \protected@edef\dtl@tuc{#1}%
  \expandafter\dtl@testifuppercase\dtl@tuc\@nil\relax
  \if@dtl@condition#2\else#3\fi
}

```

`\@testifalluppercase`

```

\def\dtl@testifuppercase#1#2{%
  \def\dtl@argi{#1}%
  \def\dtl@argii{#2}%
  \def\dtl@tc@rest{}%
  \ifx\dtl@argi\@nnil
    \let\dtl@testifuppernext=\@nnil
  \else
    \ifx#1\protect
      \let\dtl@testifuppernext=\dtl@testifuppercase
    \else
      \ifx\uppercase#1\relax
        \@dtl@conditiontrue
      \def\dtl@tc@rest{}%
    \fi
  \fi
}

```

```

        \let\dtl@testifuppernext=\relax
    \else
        \edef\dtl@tc@arg{\string#1}%
        \expandafter\dtl@test@ifuppercase\dtl@tc@arg\end
        \ifx\dtl@argii\@nnil
            \let\dtl@testifuppernext=\@dtl@gobbletonil
        \fi
    \fi
\fi
\fi
\ifx\dtl@testifuppernext\relax
    \edef\dtl@dotestifuppernext{%
        \noexpand\dtl@testifuppercase}%
\else
    \ifx\dtl@testifuppernext\@nnil
        \edef\dtl@dotestifuppernext{#2}%
    \else
        \expandafter\toks@\expandafter{\dtl@tc@rest}%
        \@dtl@toks{#2}%
        \edef\dtl@dotestifuppernext{%
            \noexpand\dtl@testifuppernext\the\toks@\the\@dtl@toks}%
    \fi
\fi
\dtl@dotestifuppernext
}

```

test@ifalluppercase

```

\def\dtl@test@ifuppercase#1#2\end{%
    \def\dtl@tc@rest{#2}%
    \IfSubStringInString{\string\MakeUppercase}{#1#2}%
    {%
        \@dtl@conditiontrue
        \def\dtl@tc@rest{}%
        \let\dtl@testifuppernext=\relax
    }%
    {%
        \IfSubStringInString{\string\MakeTextUppercase}{#1#2}%
        {%
            \@dtl@conditiontrue
            \def\dtl@tc@rest{}%
            \let\dtl@testifuppernext=\relax
        }%
        {%
            \edef\dtl@uccode{\the\uccode'#1}%
            \edef\dtl@code{\number'#1}%
            \ifnum\dtl@code=\dtl@uccode\relax
                \@dtl@conditiontrue
                \let\dtl@testifuppernext=\dtl@testifuppercase
            \else

```

```

\ifnum\dtl@uccode=0\relax
\@dtl@conditiontrue
\let\dtl@testifuppernext=\dtl@testifuppercase
\else
\@dtl@conditionfalse
\let\dtl@testifuppernext=\@dtl@gobbletonil
\fi
\fi
}%
}%
}

```

`\DTLifAllLowerCase` `\DTLifAllLowerCase{<string>}{<true part>}{<false part>}`

If *<string>* only contains lowercase characters do *<true part>*, otherwise do *<false part>*.

```

\newcommand*{\DTLifAllLowerCase}[3]{%
\protected@edef\dtl@tlc{#1}%
\expandafter\dtl@testiflowercase\dtl@tlc\@nil\relax
\if\dtl@condition#2\else#3\fi
}

```

`@testifalllowercase`

```

\def\dtl@testiflowercase#1#2{%
\def\dtl@argi{#1}%
\def\dtl@argii{#2}%
\ifx\dtl@argi\@nnil
\let\dtl@testiflowernext=\@nnil
\else
\ifx#1\protect
\let\dtl@testiflowernext=\dtl@testiflowercase
\else
\ifx\lowercase#1\relax
\@dtl@conditiontrue
\def\dtl@tc@rest{}%
\let\dtl@testiflowernext=\relax
\else
\edef\dtl@tc@arg{\string#1}%
\expandafter\dtl@testiflowercase\dtl@tc@arg\end
\ifx\dtl@argii\@nnil
\let\dtl@testiflowernext=\@dtl@gobbletonil
\fi
\fi
\fi
\fi
\ifx\dtl@testiflowernext\relax
\edef\dtl@dotestiflowernext{%
\noexpand\dtl@testiflowercase}%

```

```

\else
\ifx\dtl@testiflowernext\@nnil
\edef\dtl@dotestiflowernext{#2}%
\else
\expandafter\toks@\expandafter{\dtl@tc@rest}%
\@dtl@toks{#2}%
\edef\dtl@dotestiflowernext{%
\noexpand\dtl@testiflowernext\the\toks@\the\@dtl@toks}%
\fi
\fi
\dtl@dotestiflowernext
}

```

test@ifalllowercase

```

\def\dtl@test@iflowercase#1#2\end{%
\def\dtl@tc@rest{#2}%
\IfSubStringInString{\string\MakeLowercase}{#1#2}%
{%
\@dtl@conditiontrue
\def\dtl@tc@rest{}%
\let\dtl@testiflowernext=\relax
}%
{%
\IfSubStringInString{\string\MakeTextLowercase}{#1#2}%
{%
\@dtl@conditiontrue
\def\dtl@tc@rest{}%
\let\dtl@testiflowernext=\relax
}%
{%
\edef\dtl@lccode{\the\lccode'#1}%
\edef\dtl@code{\number'#1}%
\ifnum\dtl@code=\dtl@lccode\relax
\@dtl@conditiontrue
\let\dtl@testiflowernext=\dtl@testiflowercase
\else
\ifnum\dtl@lccode=0\relax
\@dtl@conditiontrue
\let\dtl@testiflowernext=\dtl@testiflowercase
\else
\@dtl@conditionfalse
\let\dtl@testiflowernext=\@dtl@gobbletonil
\fi
\fi
}%
}%
}

```

`\DTLsubstitute` `\DTLsubstitute{<cmd>}{<original>}{<replacement>}`

Substitutes first occurrence of *<original>* with *{<replacement>}* within the string given by *<cmd>*

```
\newcommand{\DTLsubstitute}[3]{%
  \expandafter\DTLsplitstring\expandafter
    {#1}{#2}{\@dtl@beforepart}{\@dtl@afterpart}%
  \ifdefempty{\@dtl@replaced}%
  {%
  }%
  {%
    \def#1{%
      \expandafter\@dtl@toks\expandafter{\@dtl@beforepart}%
      \expandafter\toks@\expandafter{#1}%
      \protected@edef#1{\the\toks@\the\@dtl@toks#3}%
      \expandafter\@dtl@toks\expandafter{\@dtl@afterpart}%
      \expandafter\toks@\expandafter{#1}%
      \edef#1{\the\toks@\the\@dtl@toks}%
    }%
  }%
}
```

`\DTLsplitstring` `\DTLsplitstring{<string>}{<split text>}{<before cmd>}{<after cmd>}`

Splits string at *<split text>* stores the pre split text in *<before cmd>* and the post split text in *<after cmd>*.

```
\newcommand*\DTLsplitstring[4]{%
  \def\dtl@splitstr##1#2##2\@nil{%
    \def#3{##1}%
    \def#4{##2}%
    \ifdefempty{#4}%
    {%
      \let\@dtl@replaced=\@empty
    }%
    {%
      \def\@dtl@replaced{#2}%
      \dtl@split@str##2\@nil
    }%
  }%
  \def\dtl@split@str##1#2\@nil{%
    \def#4{##1}}%
    \dtl@splitstr#1#2\@nil
}
```

`\DTLsubstituteall` `\DTLsubstituteall{<cmd>}{<original>}{<replacement>}`

Substitutes all occurrences of $\langle original \rangle$ with $\{\langle replacement \rangle\}$ within the string given by $\langle cmd \rangle$

```
\newcommand{\DTLsubstituteall}[3]{%
  \def\@dtl@splitsubstr{%
    \let\@dtl@afterpart=#1\relax
    \@dtl@dosubstitute{#2}{#3}%
    \expandafter\toks@\expandafter{\@dtl@splitsubstr}%
    \expandafter\@dtl@toks\expandafter{\@dtl@afterpart}%
    \long\edef#1{\the\toks@\the\@dtl@toks}%
  }
}
```

$\backslash\@dtl@dosubstitute$ Recursive substitution macro.

```
\def\@dtl@dosubstitute#1#2{%
  \expandafter\DTLsplitstring\expandafter
    {\@dtl@afterpart}{#1}{\@dtl@beforepart}{\@dtl@afterpart}%
  \expandafter\toks@\expandafter{\@dtl@splitsubstr}%
  \expandafter\@dtl@toks\expandafter{\@dtl@beforepart}%
  \edef\@dtl@splitsubstr{\the\toks@\the\@dtl@toks}%
  \ifdefempty{\@dtl@replaced}%
  {%
    \let\@dtl@dosubstnext=\@dtl@dosubstitutenoop
  }%
  {%
    \expandafter\toks@\expandafter{\@dtl@splitsubstr}%
    \@dtl@toks{#2}%
    \edef\@dtl@splitsubstr{\the\toks@\the\@dtl@toks}%
    \let\@dtl@dosubstnext=\@dtl@dosubstitute
  }%
  \@dtl@dosubstnext{#1}{#2}%
}
```

$\backslash\@dtl@dosubstitutenoop$ Terminates recursive substitution macro.

```
\def\@dtl@dosubstitutenoop#1#2{}
```

1.6 Conditionals

$\backslash\if@dtl@condition$

```
\newif\if@dtl@condition
```

1.6.1 Determining Data Types

The control sequence $\backslash\@dtl@checknumerical$ checks the data type of its argument, and sets $\backslash\@dtl@datatype$ to 0 if the argument is a string, 1 if the argument is an integer or 2 if the argument is a real number. First define $\backslash\@dtl@datatype$:

$\backslash\@dtl@datatype$

```
\newcount\@dtl@datatype
```

\@dtl@checknumerical

\@dtl@checknumerical{<arg>}

Checks if <arg> is numerical (includes decimal numbers, but not scientific notation.) Sets \@dtl@datatype, as described above.

```
\newcommand{\@dtl@checknumerical}[1]{%
  \@dtl@numgrpsepfalse
  \def\@dtl@tmp{#1}%
  \ifstrempy{#1}%
  {%
    \@dtl@datatype=0\relax
  }%
  {%
    \dtl@ifsingle{#1}%
    {\expandafter\toks\expandafter{#1}%
    \edef\@dtl@tmp{\the\toks}}%
    {\def\@dtl@tmp{#1}}%
    \@dtl@tmpcount=0\relax
    \@dtl@datatype=0\relax
    \@dtl@numgrpsepcount=2\relax
    \@dtl@standardize@currency\@dtl@tmp
    \ifdefempty{\@dtl@org@currency}%
    {%
    }%
    {%
      \let\@dtl@currency\@dtl@org@currency
    }%
    \expandafter\@dtl@checknumericalstart\@dtl@tmp\@nil\@nil
  }%
  \ifnum\@dtl@numgrpsepcount>-1\relax
    \if@dtl@numgrpsep
      \ifnum\@dtl@numgrpsepcount=3\relax
      \else
        \@dtl@datatype=0\relax
      \fi
    \fi
  \fi
}
```

checknumericalstart

Check first character for checknumerical process to see if it's a plus or minus sign.

```
\def\@dtl@checknumericalstart#1#2\@nil\@nil{%
  \ifx#1\protect\relax
    \@dtl@checknumericalstart#2\@nil\@nil\relax
  \else
    \ifx-#1\relax
      \def\@dtl@tmp{#2}%
      \ifdefempty{\@dtl@tmp}%
      {%
```



```

    \@dtl@datatype=0\relax
  }%
  {%
    \ifnum\@dtl@datatype=0\relax
      \@dtl@datatype=1\relax
    \fi
    \@dtl@checknumericalstart#2\@nil\@nil\relax
  }%
\else
  \ifx+#1\relax
    \def\@dtl@tmp{#2}%
    \ifdefempty{\@dtl@tmp}%
      {%
        \@dtl@datatype=0\relax
      }%
      {%
        \ifnum\@dtl@datatype=0\relax
          \@dtl@datatype=1\relax
        \fi
        \@dtl@checknumericalstart#2\@nil\@nil\relax
      }%
    \else
      \def\@dtl@tmp{#1}%
      \ifx#1$\relax
        \@dtl@datatype=3\relax
        \@dtl@checknumericalstart#2\@nil\@nil\relax
      \else
        \ifdefempty{\@dtl@tmp}%
          {%
            \@dtl@datatype=0\relax
          }%
          {%
            \ifnum\@dtl@datatype=0\relax
              \@dtl@datatype=1\relax
            \fi
            \@dtl@checknumericalloop#1#2\@nil\@nil\relax
          }%
        \fi
      \fi
    \fi
  }

```

`\if@dtl@numgrpsep` The conditional `\if@dtl@numgrpsep` is set the first time `\@dtl@checknumericalloop` encounters the number group separator.

`\newif\if@dtl@numgrpsep`

`\ifDigitOrDecimalSep` Check if argument is either a digit or the decimal separator. Rewrite provided by Bruno Le Floch.

```

\newcommand*{\@dtl@ifDigitOrDecimalSep}[3]{%
  \ifnum 9<1\noexpand#1\relax
    #2%
  \else
    \expandafter\ifx\@dtl@decimal#1\relax
      #2%
    \else
      #3%
    \fi
  \fi
}

```

`@checknumericalloop` Check numerical loop. This iterates through each character until `\@nil` is reached, or invalid character found. Increments `\@dtl@tmpcount` each time it encounters a decimal character.

```

\def\@dtl@checknumericalloop#1#2\@nil{%
\def\@dtl@tmp{#1}%
\ifx\@nnil\@dtl@tmp\relax
  \let\@dtl@chcknumnext=\@dtl@checknumericalnoop%
\else
  \@dtl@ifDigitOrDecimalSep{#1}{%
    \let\@dtl@chcknumnext=\@dtl@checknumericalloop%
    \expandafter\ifx\@dtl@decimal#1\relax
      \if@dtl@numgrpsep
        \ifnum\@dtl@numgrpsepcount=3\relax
          \@dtl@numgrpsepcount=-1\relax
        \else
          \@dtl@datatype=0\relax
          \let\@dtl@chcknumnext=\@dtl@checknumericalnoop
        \fi
      \else
        \@dtl@numgrpsepcount=-1\relax
      \fi
    \else
      \ifnum\@dtl@numgrpsepcount=-1\relax
        \else
          \advance\@dtl@numgrpsepcount by 1\relax
        \fi
      \fi
    }{%
  \ifx\@dtl@numbergroupchar\@dtl@tmp\relax
    \@dtl@numgrpseptrue
    \ifnum\@dtl@numgrpsepcount<3\relax
      \@dtl@datatype=0\relax
      \let\@dtl@chcknumnext=\@dtl@checknumericalnoop
    \else
      \@dtl@numgrpsepcount=0\relax
    \fi
  \else

```

```

\@dtl@datatype=0\relax
\let\@dtl@chcknumnext=\@dtl@checknumericalnoop
\fi
}%
\ifx\@dtl@decimal\@dtl@tmp\relax
\ifnum\@dtl@datatype<3\relax
\@dtl@datatype=2\relax
\fi
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount>1\relax
\@dtl@datatype=0\relax
\let\@dtl@chcknumnext=\@dtl@checknumericalnoop%
\fi
\fi
\fi
\@dtl@chcknumnext#2\@nil
}

```

@checknumericalnoop End loop

```
\def\@dtl@checknumericalnoop#1\@nil#2{}
```

\DTLifnumerical `\DTLifnumerical{<arg>}{<true part>}{<false part>}`

Tests the first argument, if its numerical do second argument, otherwise do third argument.

```

\newcommand{\DTLifnumerical}[3]{%
\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=0\relax#3\else#2\fi
}

```

\DTLifreal `\DTLifreal{<arg>}{<true part>}{<false part>}`

Tests the first argument, if it's a real number (not an integer) do second argument, otherwise do third argument.

```

\newcommand{\DTLifreal}[3]{%
\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=2\relax #2\else #3\fi
}

```

\DTLifint `\DTLifint{<arg>}{<true part>}{<false part>}`

Tests the first argument, if it's an integer do second argument, otherwise do third argument.

```
\newcommand{\DTLifint}[3]{%
```

```

\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=1\relax #2\else #3\fi
}

```

`\DTLifstring` `\DTLifstring{<arg>}{<true part>}{<false part>}`

Tests the first argument, if it's a string do second argument, otherwise do third argument.

```

\newcommand{\DTLifstring}[3]{%
\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=0\relax #2\else #3\fi
}

```

`\DTLifcurrency` `\DTLifcurrency{<arg>}{<true part>}{<false part>}`

Tests the first argument, if it starts with the currency symbol do second argument, otherwise do third argument.

```

\newcommand{\DTLifcurrency}[3]{%
\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=3\relax #2\else #3\fi
}

```

`\DTLifcurrencyunit` `\DTLifcurrencyunit{<arg>}{<symbol>}{<true part>}{<false part>}`

This tests if *<arg>* is currency, and uses the currency unit *<symbol>*. If true do third argument, otherwise do fourth argument.

```

\newcommand*\DTLifcurrencyunit[4]{%
\@dtl@checknumerical{#1}%
\ifnum\@dtl@datatype=3\relax
\ifthenelse{\equal{\@dtl@org@currency}{#2}}{#3}{#4}%
\else
#4%
\fi
}

```

`\DTLifcasedatatype` `\DTLifcasedatatype{<arg>}{<string case>}{<int case>}{<real case>}{<currency case>}`

If *<arg>* is a string, do *<string case>*, if *<arg>* is an integer do *<int case>*, if *<arg>* is a real number, do *<real case>*, if *<arg>* is currency, do *<currency case>*.

```

\newcommand{\DTLifcasedatatype}[5]{%
\@dtl@checknumerical{#1}%
\ifcase\@dtl@datatype

```

```

    #2% string
\or
    #3% integer
\or
    #4% number
\or
    #5% currency
\fi
}

```

dtl@testbothnumerical

```
\dtl@testbothnumerical{<arg1>}{<arg2>}
```

Tests if both arguments are numerical. This sets the conditional \if@dtl@condition.

```

\newcommand*{\dtl@testbothnumerical}[2]{%
  \dtl@ifsingle{#1}{%
    \edef\@dtl@tmp{#1}{%
      \def\@dtl@tmp{#1}}%
    \expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
    \edef\@dtl@firsttype{\number\@dtl@datatype}%
    \dtl@ifsingle{#2}{%
      \edef\@dtl@tmp{#2}{%
        \def\@dtl@tmp{#2}}%
      \expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
      \multiply\@dtl@datatype by \@dtl@firsttype\relax
      \ifnum\@dtl@datatype>0\relax
        \@dtl@conditiontrue
      \else
        \@dtl@conditionfalse
      \fi
    }%
  }%
}

```

\DTLifnumlt

```
\DTLifnumlt{<num1>}{<num2>}{<true part>}{<false part>}
```

Determines if $\{<num1>\} < \{<num2>\}$. Both numbers need to have the decimal separator changed to a dot to ensure that it works with \dtlifnumlt

```

\newcommand*{\DTLifnumlt}[4]{%
  \DTLconverttodecimal{#1}{\@dtl@numi}%
  \DTLconverttodecimal{#2}{\@dtl@numii}%
  \dtlifnumlt{\@dtl@numi}{\@dtl@numii}%
  {%
    #3%
  }%
  {%
    #4%
  }%
}

```

`\dtlcompare` `\dtlcompare{<count>}{<string1>}{<string2>}`

Compares $\langle string1 \rangle$ and $\langle string2 \rangle$, and stores the result in the count register $\langle count \rangle$. The result may be one of:

- 1 if $\langle string1 \rangle$ is considered to be less than $\langle string2 \rangle$
- 0 if $\langle string1 \rangle$ is considered to be the same as $\langle string2 \rangle$
- 1 if $\langle string1 \rangle$ is considered to be greater than $\langle string2 \rangle$

Note that for the purposes of string comparisons, commands within $\langle string1 \rangle$ and $\langle string2 \rangle$ are ignored, except for `\space` and `~`, which are both treated as a space (character code 32.) The following examples assume that the count register `\mycount` has been defined as follows:

`\newcount\mycount`

Examples:

1. `\dtlcompare{\mycount}{Z\oe}{Zoe}\number\mycount`
produces: 0, since the accent command is ignored.
2. `\dtlcompare{\mycount}{foo}{Foo}\number\mycount`
produces: 1, since the comparison is case sensitive, however, note the following example:
3. `\dtlcompare{\mycount}{foo}{\uppercase{f}oo}\number\mycount`
which produces: 0, since the `\uppercase` command is ignored.
4. You can “trick” `\dtlcompare` using a command which doesn’t output any text. Suppose you have defined the following command:

`\newcommand*\noopsort}[1]{}`

then `\noopsort{a}foo` produces the text: foo, however the following

`\dtlcompare{\mycount}{\noopsort{a}foo}{bar}\number\mycount`

produces: -1, since the command `\noopsort` is disregarded when the comparison is made, so `\dtlcompare` just compares `{a}foo` with `bar`, and since `a` is less than `b`, the first string is considered to be less than the second string.

5. Note that this also means that:

`\def\mystr{abc}%`
`\dtlcompare{\mycount}{\mystr}{abc}\number\mycount`

produces: -1, since the command `\mystx` is disregarded, which means that `\dtlcompare` is comparing an empty string with the string `abc`.

6. Spaces count in the comparison:

```
\dtlcompare{\mycount}{ab cd}{abcd}\number\mycount
```

produces: 0, but sequential spaces are treated as a single space:

```
\dtlcompare{\mycount}{ab cd}{ab cd}\number\mycount
```

produces: 0.

7. As usual, spaces following command names are ignored, so

```
\dtlcompare{\mycount}{ab\relax cd}{ab cd}\number\mycount
```

produces: 0.

8. `~` and `\space` are considered to be the same as a space:

```
\dtlcompare{\mycount}{ab cd}{ab~cd}\number\mycount
```

produces: 0.

```
\newcommand*\dtlcompare}[3]{%
  \dtl@subnobrsp{#2}{\@dtl@argA}%
  \dtl@subnobrsp{#3}{\@dtl@argB}%
  \ifdefempty{\@dtl@argA}%
  {%
    \ifdefempty{\@dtl@argB}%
    {%
      #1=0\relax
    }%
  }%
  {%
    #1=-1\relax
  }%
}%
{%
  \ifdefempty{\@dtl@argB}%
  {%
    #1=1\relax
  }%
}%
  \DTLsubstituteall{\@dtl@argA}{ }\{\space }%
  \DTLsubstituteall{\@dtl@argB}{ }\{\space }%
  \expandafter\dtl@getfirst\@dtl@argA\end
  \let\dtl@firstA=\dtl@first
  \let\dtl@restA=\dtl@rest
```

```

\expandafter\dtl@getfirst\@dtl@argB\end
\let\dtl@firstB=\dtl@first
\let\dtl@restB=\dtl@rest
\expandafter\dtl@ifsingle\expandafter{\dtl@firstA}{%
\expandafter\dtl@ifsingle\expandafter{\dtl@firstB}{%
\expandafter\dtl@setcharcode\expandafter{\dtl@firstA}{\dtl@codeA}%
\expandafter\dtl@setcharcode\expandafter{\dtl@firstB}{\dtl@codeB}%
\ifnum\dtl@codeA=-1\relax
  \ifnum\dtl@codeB=-1\relax
    \protected@edef\dtl@donext{%
      \noexpand\dtlcompare{\noexpand#1}{\dtl@restA}{\dtl@restB}}%
    \dtl@donext
  \else
    \protected@edef\dtl@donext{%
      \noexpand\dtlcompare
        {\noexpand#1}{\dtl@restA}{\dtl@firstB\dtl@restB}}%
    \dtl@donext
  \fi
\else
  \ifnum\dtl@codeB=-1\relax
    \protected@edef\dtl@donext{%
      \noexpand\dtlcompare
        {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@restB}}%
    \dtl@donext
  \else
    \ifnum\dtl@codeA<\dtl@codeB
      #1=-1\relax
    \else
      \ifnum\dtl@codeA>\dtl@codeB
        #1=1\relax
      \else
        \ifdefempty{\dtl@restA}%
          {%
            \ifdefempty{\dtl@restB}%
              {%
                #1=0\relax
              }%
            {%
              #1=-1\relax
            }%
          }%
        {%
          \ifdefempty{\restB}%
            {%
              #1=1\relax
            }%
          {%
            \protected@edef\dtl@donext{%
              \noexpand\dtlcompare

```



```

        {\noexpand#1}{\dtl@restA}{\dtl@restB}}%
      \dtl@donext
    }%
  }%
\fi
\fi
\fi
\fi
}{%
\protected@edef\dtl@donext{%
  \noexpand\dtlcompare
    {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
\dtl@donext
} }{%
\protected@edef\dtl@donext{%
  \noexpand\dtlcompare
    {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
\dtl@donext
}%
}%
}%
}

```

`\dtl@getfirst` Gets the first object, and stores in `\dtl@first`. The remainder is stored in `\dtl@rest`.

```

\def\dtl@getfirst#1#2\end{%
  \def\dtl@first{#1}%
  \ifdefempty{\dtl@first}%
  {%
    \def\dtl@rest{#2}%
  }%
  {%
    \dtl@ifsingle{#1}{\def\dtl@rest{#2}}{\dtl@getfirst#1#2\end}%
  }%
}

```

Count registers to store character codes:

```

\newcount\dtl@codeA
\newcount\dtl@codeB

```

`\dtl@setcharcode` `\dtl@setcharcode{<c>}{<count register>}`

Sets *<count register>* to the character code of *<c>*, or to -1 if *<c>* is a control sequence, unless *<c>* is either `\space` or `~` in which case it sets *<count register>* to the character code of the space character.

```

\newcommand*\dtl@setcharcode[2]{%
  \ifstrempy{#1}%

```

```

{ %
  #2=-1\relax
}%
{ %
  \ifx#1\space\relax
    #2=' \relax
  \else
    \ifx#1~\relax
      #2=' \relax
    \else
      \ifcat\noexpand#1\relax
        #2=-1\relax
      \else
        #2='#1\relax
      \fi
    \fi
  \fi
}%
}

```

`\dtl@setlccharcode` `\dtl@setlccharcode{<c>}{<count register>}`

As `\dtl@setlccharcode` except it sets *<count register>* to the lower case character code of *<c>*, unless *<c>* is a control sequence, in which case it does the same as `\dtl@setcharcode`.

```

\newcommand*{\dtl@setlccharcode}[2]{ %
  \ifstrempy{#1}%
  { %
    #2=-1\relax
  } %
  { %
    \ifx#1\space\relax
      #2=' \relax
    \else
      \ifx#1~\relax
        #2=' \relax
      \else
        \ifcat\noexpand#1\relax%
          #2=-1\relax
        \else
          #2=\lccode'#1\relax
        \fi
      \fi
    \fi
  } %
}

```

`\dtlcompare` `\dtlcompare{<count>}{<string1>}{<string2>}`

As `\dtlcompare` but ignores case.

```
\newcommand*{\dtlcompare}[3]{%
  \dtl@subnohrsp{#2}{\@dtl@argA}%
  \dtl@subnohrsp{#3}{\@dtl@argB}%
  \ifdefempty{\@dtl@argA}%
  {%
    \ifdefempty{\@dtl@argB}%
    {%
      #1=0\relax
    }%
    {%
      #1=-1\relax
    }%
  }%
  {%
    \ifdefempty{\@dtl@argB}%
    {%
      #1=1\relax
    }%
    {%
      \DTLsubstituteall{\@dtl@argA}{ }{\space}%
      \DTLsubstituteall{\@dtl@argB}{ }{\space}%
      \expandafter\dtl@getfirst\@dtl@argA\end
      \let\dtl@firstA=\dtl@first
      \let\dtl@restA=\dtl@rest
      \expandafter\dtl@getfirst\@dtl@argB\end
      \let\dtl@firstB=\dtl@first
      \let\dtl@restB=\dtl@rest
      \expandafter\dtl@ifsingle\expandafter{\dtl@firstA}{%
        \expandafter\dtl@ifsingle\expandafter{\dtl@firstB}{%
          \expandafter\dtl@setlccharcode\expandafter{\dtl@firstA}{\dtl@codeA}%
          \expandafter\dtl@setlccharcode\expandafter{\dtl@firstB}{\dtl@codeB}%
          \ifnum\dtl@codeA=-1\relax
            \ifnum\dtl@codeB=-1\relax
              \protected@edef\dtl@donext{%
                \noexpand\dtlcompare{\noexpand#1}{\dtl@restA}{\dtl@restB}}%
              \dtl@donext
            \else
              \protected@edef\dtl@donext{%
                \noexpand\dtlcompare
                  {\noexpand#1}{\dtl@restA}{\dtl@firstB\dtl@restB}}%
              \dtl@donext
            \fi
          \else
            \ifnum\dtl@codeB=-1\relax
              \protected@edef\dtl@donext{%
```

```

        \noexpand\dtlicompare
        {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@restB}}%
    \dtl@donext
\else
    \ifnum\dtl@codeA<\dtl@codeB
        #1=-1\relax
    \else
        \ifnum\dtl@codeA>\dtl@codeB
            #1=1\relax
        \else
            \ifdefempty{\dtl@restA}%
            {%
                \ifdefempty{\dtl@restB}%
                {%
                    #1=0\relax
                }%
            }%
            {%
                #1=-1\relax
            }%
        }%
        {%
            \ifdefempty{\restB}%
            {%
                #1=1\relax
            }%
        }%
        \protected@edef\dtl@donext{%
            \noexpand\dtlicompare
            {\noexpand#1}{\dtl@restA}{\dtl@restB}}%
        \dtl@donext
    }%
}%
\fi
\fi
\fi
\fi
}}{%
\protected@edef\dtl@donext{%
    \noexpand\dtlicompare
    {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
\dtl@donext
}}{%
\protected@edef\dtl@donext{%
    \noexpand\dtlicompare
    {\noexpand#1}{\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
\dtl@donext
}%
}%
}%

```

}

`\DTLifstringlt` `\DTLifstringlt{<string1>}{<string2>}{<true part>}{<false part>}`

String comparison (Starred version ignores case)

`\newcommand*{\DTLifstringlt}{\@ifstar\@sDTLifstringlt\@DTLifstringlt}`

Unstarred version

```
\newcommand*{\@DTLifstringlt}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount<0\relax
    #3%
  \else
    #4%
  \fi
}
```

Starred version

```
\newcommand*{\@sDTLifstringlt}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlicompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount<0\relax
    #3%
  \else
    #4%
  \fi
}
```

`\DTLiflt` `\DTLiflt{<arg1>}{<arg2>}{<true part>}{<false part>}`

Does `\DTLifnumlt` if both `<arg1>` and `<arg2>` are numerical, otherwise do `\DTLifstringlt` (unstarred version) or `\DTLifstringlt*` (starred version).

`\newcommand*{\DTLiflt}{\@ifstar\@sDTLiflt\@DTLiflt}`

Unstarred version

```
\newcommand*{\@DTLiflt}[4]{%
  \dtl@testbothnumerical{#1}{#2}%
  \if@dtl@condition
    \DTLifnumlt{#1}{#2}{#3}{#4}%
  \else
    \@DTLifstringlt{#1}{#2}{#3}{#4}%
  \fi
}
```

Starred version

```
\newcommand*\@sDTLiflt}[4]{%
  \dtl@testbothnumerical{#1}{#2}%
  \if@dtl@condition
    \DTLifnumlt{#1}{#2}{#3}{#4}%
  \else
    \@sDTLifstringlt{#1}{#2}{#3}{#4}%
  \fi
}
```

`\DTLifnumgt` `\DTLifnumgt{<num1>}{<num2>}{<true part>}{<false part>}`

Determines if $\{<num1>\} > \{<num2>\}$. Both numbers need to have the decimal separator changed to a dot to ensure that it works with `\dtlifnumgt`

```
\newcommand*\DTLifnumgt}[4]{%
  \DTLconverttodecimal{#1}{\@dtl@numi}%
  \DTLconverttodecimal{#2}{\@dtl@numii}%
  \dtlifnumgt{\@dtl@numi}{\@dtl@numii}%
  {%
    #3%
  }%
  {%
    #4%
  }%
}
```

`\DTLifstringgt` `\DTLifstringgt{<string1>}{<string2>}{<true part>}{<false part>}`

String comparison (starred version ignores case)

```
\newcommand*\DTLifstringgt{\@ifstar\@sDTLifstringgt\@DTLifstringgt}
```

Unstarred version

```
\newcommand*\@DTLifstringgt}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount>0\relax
    #3%
  \else
    #4%
  \fi
}
```

Starred version

```
\newcommand*\@sDTLifstringgt}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlicompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
```

```

\@dtl@tmpcmp
\ifnum\@dtl@tmpcount>0\relax
#3%
\else
#4%
\fi
}

```

\DTLifgt `\DTLifgt{<arg1>}{<arg2>}{<true part>}{<false part>}`

Does \DTLifnumgt if both <arg1> and <arg2> are numerical, otherwise do \DTLifstringgt or \DTLifstringgt*.

```
\newcommand*{\DTLifgt}{\@ifstar\@sDTLifgt\@DTLifgt}
```

Unstarred version

```

\newcommand*{\@DTLifgt}[4]{%
\dtl@testbothnumerical{#1}{#2}%
\if@dtl@condition
\DTLifnumgt{#1}{#2}{#3}{#4}%
\else
\@DTLifstringgt{#1}{#2}{#3}{#4}%
\fi
}

```

Starred version

```

\newcommand*{\@sDTLifgt}[4]{%
\dtl@testbothnumerical{#1}{#2}%
\if@dtl@condition
\DTLifnumgt{#1}{#2}{#3}{#4}%
\else
\@sDTLifstringgt{#1}{#2}{#3}{#4}%
\fi
}

```

\DTLifnumeq `\DTLifnumeq{<num1>}{<num2>}{<true part>}{<false part>}`

Determines if {<num1>} = {<num2>}. Both numbers need to have the decimal separator changed to a dot to ensure that it works with \dtlifnumeq

```

\newcommand*{\DTLifnumeq}[4]{%
\DTLconverttodecimal{#1}{\@dtl@numi}%
\DTLconverttodecimal{#2}{\@dtl@numii}%
\dtlifnumeq{\@dtl@numi}{\@dtl@numii}%
{%
#3%
}%
{%
#4%
}%
}

```

```
}%
}
```

`\DTLifstringeq` `\DTLifstringeq{<string1>}{<string2>}{<true part>}{<false part>}`

String comparison (starred version ignores case)

```
\newcommand*{\DTLifstringeq}{\@ifstar\@sDTLifstringeq\@DTLifstringeq}
```

Unstarred version

```
\newcommand*{\@DTLifstringeq}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount=0\relax
    #3%
  \else
    #4%
  \fi
}
```

Starred version

```
\newcommand*{\@sDTLifstringeq}[4]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount=0\relax
    #3%
  \else
    #4%
  \fi
}
```

`\DTLifeq` `\DTLifeq{<arg1>}{<arg2>}{<true part>}{<false part>}`

Does `\DTLifnumeq` if both `<arg1>` and `<arg2>` are numerical, otherwise do `\DTLifstringeq` or `\DTLifstringeq*`.

```
\newcommand*{\DTLifeq}{\@ifstar\@sDTLifeq\@DTLifeq}
```

Unstarred version

```
\newcommand*{\@DTLifeq}[4]{%
  \dtl@testbothnumerical{#1}{#2}%
  \ifdtl@condition
    \DTLifnumeq{#1}{#2}{#3}{#4}%
  \else
    \DTLifstringeq{#1}{#2}{#3}{#4}%
  \fi
}
```


Starred version

```
\newcommand*\@sDTLlifeq}[4]{%
  \dtl@testbothnumerical{#1}{#2}%
  \if@dtl@condition
    \DTLlifnumeq{#1}{#2}{#3}{#4}%
  \else
    \@sDTLlifstringeq{#1}{#2}{#3}{#4}%
  \fi
}
```

`\DTLifSubString` `\DTLifSubString{<string>}{<sub string>}{<true part>}{<false part>}`

If `<sub string>` is contained in `<string>` does `<true part>`, otherwise does `<false part>`.

```
\newcommand*\DTLifSubString}[4]{%
  \protected@edef\@dtl@tmp{\noexpand\dtl@testifsubstring
    {#1}{#2}}%
  \@dtl@tmp
  \if@dtl@condition
    #3%
  \else
    #4%
  \fi
}
```

`dtl@testifsubstring`

```
\newcommand*\dtl@testifsubstring}[2]{%
  \dtl@subnobrsp{#1}{\@dtl@argA}%
  \dtl@subnobrsp{#2}{\@dtl@argB}%
  \ifdefempty{\@dtl@argB}%
  {%
    \@dtl@conditiontrue
  }%
  {%
    \ifdefempty{\@dtl@argA}%
    {%
      \@dtl@conditionfalse
    }%
    {%
      \dtl@teststartswith{#1}{#2}%
      \if@dtl@condition
      \else
        \DTLsubstituteall{\@dtl@argA}{ }\space}%
        \expandafter\dtl@getfirst\@dtl@argA\end
        \expandafter\dtl@ifsingle\expandafter{\dtl@first}{%
          \expandafter\dtl@testifsubstring\expandafter{\dtl@rest}{#2}%
        }{%

```

```

        \protected@edef\@dtl@donext{\noexpand\dtl@testifsubstring
        {\dtl@first\dtl@rest}{\@dtl@argB}}%
        \@dtl@donext
    }%
\fi
}%
}%
}

```

`\DTLifStartsWith` `\DTLifStartsWith{<string>}{<substring>}{<true part>}{<false part>}`

If *<string>* starts with *<substring>*, this does *<true part>*, otherwise it does *<false part>*.

```

\newcommand*\DTLifStartsWith[4]{%
  \@dtl@conditionfalse
  \protected@edef\@dtl@tmp{\noexpand\dtl@teststartswith{#1}{#2}}%
  \@dtl@tmp
  \if@dtl@condition
    #3%
  \else
    #4%
  \fi
}

```

`\dtl@teststartswith` `\dtl@teststartswith{<string>}{<prefix>}`

Tests if *<string>* starts with *<prefix>*. This sets `\if@dtl@condition`.

```

\newcommand*\dtl@teststartswith[2]{%
  \dtl@subnobrsp{#1}{\@dtl@argA}%
  \dtl@subnobrsp{#2}{\@dtl@argB}%
  \ifdefempty{\@dtl@argA}%
  {%
    \ifdefempty{\@dtl@argB}%
    {%
      \@dtl@conditiontrue
    }%
    {%
      \@dtl@conditionfalse
    }%
  }%
}%
\ifdefempty{\@dtl@argB}%
{%
  \@dtl@conditiontrue
}%
}%

```

```

\DTLsubstituteall{\@dtl@argA}{ }{\space }%
\DTLsubstituteall{\@dtl@argB}{ }{\space }%
\expandafter\dtl@getfirst\@dtl@argA\end
\let\dtl@firstA=\dtl@first
\let\dtl@restA=\dtl@rest
\expandafter\dtl@getfirst\@dtl@argB\end
\let\dtl@firstB=\dtl@first
\let\dtl@restB=\dtl@rest
\expandafter\dtl@ifsingle\expandafter{\dtl@firstA}{%
\expandafter\dtl@ifsingle\expandafter{\dtl@firstB}{%
\expandafter\dtl@setcharcode\expandafter{\dtl@firstA}{\dtl@codeA}%
\expandafter\dtl@setcharcode\expandafter{\dtl@firstB}{\dtl@codeB}%
\ifnum\dtl@codeA=-1\relax
  \ifnum\dtl@codeB=-1\relax
    \protected@edef\dtl@donext{%
      \noexpand\dtl@teststartswith{\dtl@restA}{\dtl@restB}}%
    \dtl@donext
  \else
    \protected@edef\dtl@donext{%
      \noexpand\dtl@teststartswith
        {\dtl@restA}{\dtl@firstB\dtl@restB}}%
    \dtl@donext
  \fi
\else
  \ifnum\dtl@codeB=-1\relax
    \protected@edef\dtl@donext{%
      \noexpand\dtl@teststartswith
        {\dtl@firstA\dtl@restA}{\dtl@restB}}%
    \dtl@donext
  \else
    \ifnum\dtl@codeA=\dtl@codeB
      \protected@edef\dtl@donext{%
        \noexpand\dtl@teststartswith{\dtl@restA}{\dtl@restB}}%
      \dtl@donext
    \else
      \@dtl@conditionfalse
    \fi
  \fi
\fi
\fi
}}{%
\protected@edef\dtl@donext{%
  \noexpand\dtl@teststartswith
    {\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
\dtl@donext
}}{%
\protected@edef\dtl@donext{%
  \noexpand\dtl@teststartswith
    {\dtl@firstA\dtl@restA}{\dtl@firstB\dtl@restB}}%
}%

```

```

    }%
  }%
}

```

DTLifnumclosedbetween

```
\DTLifnumclosedbetween{<num>}{<min>}{<max>}{<true part>}{<false
part>}
```

Determines if $\langle min \rangle \leq \langle num \rangle \leq \langle max \rangle$.

```

\newcommand*{\DTLifnumclosedbetween}[5]{%
  \DTLconverttodecimal{#1}{\@dtl@numi}%
  \DTLconverttodecimal{#2}{\@dtl@numii}%
  \DTLconverttodecimal{#3}{\@dtl@numiii}%
  \DTLifFPclosedbetween{\@dtl@numi}{\@dtl@numii}{\@dtl@numiii}{#4}{#5}%
}

```

DTLifstringclosedbetween

```
\DTLifstringclosedbetween{<string>}{<min>}{<max>}{<true
part>}{<false part>}
```

String comparison (starred version ignores case)

```

\newcommand*{\DTLifstringclosedbetween}{%
  \@ifstar\@sDTLifstringclosedbetween\@DTLifstringclosedbetween
}

```

Unstarred version

```

\newcommand*{\@DTLifstringclosedbetween}[5]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \let\@dtl@dovalue\relax
  \ifnum\@dtl@tmpcount<0\relax
    \def\@dtl@dovalue{#5}%
  \fi
  \ifx\@dtl@dovalue\relax
    \protected@edef\@dtl@tmpcmp{%
      \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#3}}%
    \@dtl@tmpcmp
    \ifnum\@dtl@tmpcount>0\relax
      \def\@dtl@dovalue{#5}%
    \else
      \def\@dtl@dovalue{#4}%
    \fi
  \fi
  \@dtl@dovalue
}

```

Starred version

```
\newcommand*{\@sDTLifstringclosedbetween}[5]{%
```

```

\protected@edef\@dtl@tmpcmp{%
  \noexpand\dtlicompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
\@dtl@tmpcmp
\let\@dtl@dovalue\relax
\ifnum\@dtl@tmpcount<0\relax
  \def\@dtl@dovalue{#5}%
\fi
\ifx\@dtl@dovalue\relax
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlicompare{\noexpand\@dtl@tmpcount}{#1}{#3}}%
  \@dtl@tmpcmp
  \ifnum\@dtl@tmpcount>0\relax
    \def\@dtl@dovalue{#5}%
  \else
    \def\@dtl@dovalue{#4}%
  \fi
\fi
\@dtl@dovalue
}

```

\DTLifclosedbetween

\DTLifclosedbetween{<arg>}{<min>}{<max>}{<true part>}{<false part>}

Does \DTLifnumclosedbetween if {<arg>}, <min> and <max> are numerical, otherwise do \DTLifstringclosedbetween or \DTLifstringclosedbetween*.

```

\newcommand*\DTLifclosedbetween{%
  \@ifstar\@sDTLifclosedbetween\@DTLifclosedbetween
}

```

Unstarred version

```

\newcommand*\@DTLifclosedbetween[5]{%
  \dtl@testbothnumerical{#2}{#3}%
  \if@dtl@condition
    \dtl@ifsingle{#1}{%
      \edef\@dtl@tmp{#1}{%
        \def\@dtl@tmp{#1}}%
      \expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
      \ifnum\@dtl@datatype>0\relax
        \DTLifnumclosedbetween{#1}{#2}{#3}{#4}{#5}%
      \else
        \@DTLifstringclosedbetween{#1}{#2}{#3}{#4}{#5}%
      \fi
    \else
      \@DTLifstringclosedbetween{#1}{#2}{#3}{#4}{#5}%
    \fi
  }
}

```

Starred version

```

\newcommand*\@sDTLifclosedbetween}[5]{%
  \dtl@testbothnumerical{#2}{#3}%
  \if@dtl@condition
    \dtl@ifsingle{#1}{%
      \edef\@dtl@tmp{#1}}{%
      \def\@dtl@tmp{#1}}%
    \expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
    \ifnum\@dtl@datatype>0\relax
      \DTLifnumclosedbetween{#1}{#2}{#3}{#4}{#5}%
    \else
      \@sDTLifstringclosedbetween{#1}{#2}{#3}{#4}{#5}%
    \fi
  \else
    \@sDTLifstringclosedbetween{#1}{#2}{#3}{#4}{#5}%
  \fi
}

```

\DTLifnumopenbetween

```

\DTLifnumopenbetween{<num>}{<min>}{<max>}{<true part>}{<false
part>}

```

Determines if $\langle min \rangle < \langle num \rangle < \langle max \rangle$.

```

\newcommand*\@DTLifnumopenbetween}[5]{%
  \DTLconverttodecimal{#1}{\@dtl@numi}%
  \DTLconverttodecimal{#2}{\@dtl@numii}%
  \DTLconverttodecimal{#3}{\@dtl@numiii}%
  \DTLifFPopenbetween{\@dtl@numi}{\@dtl@numii}{\@dtl@numiii}{#4}{#5}%
}

```

\DTLifstringopenbetween

```

\DTLifstringopenbetween{<string>}{<min>}{<max>}{<true part>}{<false
part>}

```

String comparison (starred version ignores case)

```

\newcommand*\@DTLifstringopenbetween}{%
  \@ifstar\@sDTLifstringopenbetween\@DTLifstringopenbetween
}

```

Unstarred version:

```

\newcommand*\@DTLifstringopenbetween}[5]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \let\@dtl@dovalue\relax
  \ifnum\@dtl@tmpcount>0\relax
  \else
    \def\@dtl@dovalue{#5}%
  \fi
  \ifx\@dtl@dovalue\relax

```

```

\protected@edef\@dtl@tmpcmp{%
  \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#3}}%
\@dtl@tmpcmp
\ifnum\@dtl@tmpcount<0\relax
  \def\@dtl@dovalue{#4}%
\else
  \def\@dtl@dovalue{#5}%
\fi
\fi
\@dtl@dovalue
}

```

Starred version

```

\newcommand*{\@sDTLifstringopenbetween}[5]{%
  \protected@edef\@dtl@tmpcmp{%
    \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#2}}%
  \@dtl@tmpcmp
  \let\@dtl@dovalue\relax
  \ifnum\@dtl@tmpcount>0\relax
  \else
    \def\@dtl@dovalue{#5}%
  \fi
  \ifx\@dtl@dovalue\relax
    \protected@edef\@dtl@tmpcmp{%
      \noexpand\dtlcompare{\noexpand\@dtl@tmpcount}{#1}{#3}}%
    \@dtl@tmpcmp
    \ifnum\@dtl@tmpcount<0\relax
      \def\@dtl@dovalue{#4}%
    \else
      \def\@dtl@dovalue{#5}%
    \fi
  \fi
  \@dtl@dovalue
}

```

`\DTLifopenbetween` `\DTLifopenbetween{<arg>}{<min>}{<max>}{<true part>}{<false part>}`

Does `\DTLifnumopenbetween` if `{<arg>}`, `<min>` and `<max>` are numerical, otherwise do `\DTLifstringopenbetween` or `\DTLifstringopenbetween*`.

```

\newcommand*{\DTLifopenbetween}{%
  \@ifstar\@sDTLifopenbetween\@DTLifopenbetween
}

```

Unstarred version

```

\newcommand*{\@DTLifopenbetween}[5]{%
  \dtl@testbothnumerical{#2}{#3}%
  \if@dtl@condition
    \dtl@ifsingle{#1}{%
      \edef\@dtl@tmp{#1}}{%

```

```

\def\@dtl@tmp{#1}}%
\expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
\ifnum\@dtl@datatype>0\relax
\DTLifnumopenbetween{#1}{#2}{#3}{#4}{#5}%
\else
\@DTLifstringopenbetween{#1}{#2}{#3}{#4}{#5}%
\fi
\else
\@DTLifstringopenbetween{#1}{#2}{#3}{#4}{#5}%
\fi
}

```

Starred version

```

\newcommand*{\@sDTLifopenbetween}[5]{%
\dtl@testbothnumerical{#2}{#3}%
\if@dtl@condition
\dtl@ifsingle{#1}{%
\edef\@dtl@tmp{#1}}{%
\def\@dtl@tmp{#1}}%
\expandafter\@dtl@checknumerical\expandafter{\@dtl@tmp}%
\ifnum\@dtl@datatype>0\relax
\DTLifnumopenbetween{#1}{#2}{#3}{#4}{#5}%
\else
\@sDTLifstringopenbetween{#1}{#2}{#3}{#4}{#5}%
\fi
\else
\@sDTLifstringopenbetween{#1}{#2}{#3}{#4}{#5}%
\fi
}

```

\DTLifFPopenbetween

```
\DTLifFPopenbetween{<num>}{<min>}{<max>}{<true part>}{<>false
part>}
```

Determines if $\langle min \rangle < \langle num \rangle < \langle max \rangle$ where all arguments are in standard fixed point notation. (Command name maintained for backward compatibility.)

```
\let\DTLifFPopenbetween\dtlifnumopenbetween
```

\DTLifFPclosedbetween

```
\DTLifFPclosedbetween{<num>}{<min>}{<max>}{<true part>}{<>false
part>}
```

Determines if $\langle min \rangle \leq \langle num \rangle \leq \langle max \rangle$. (Command name maintained for backward compatibility.)

```
\let\DTLifFPclosedbetween\dtlifnumclosedbetween
```


1.6.2 ifthen Conditionals

The following commands provide conditionals `\DTLis...` which can be used in `\ifthenelse`.

<code>\dtl@testlt</code>	Command to test if first argument is less than second argument. If either argument is a string, a case sensitive string comparison is used instead. This sets <code>\if@dtl@condition</code> . <pre>\newcommand*\dtl@testlt}[2]{% \DTLiflt{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}% }</pre>
<code>\DTLislt</code>	Provide conditional command for use in <code>\ifthenelse</code> <pre>\newcommand*\DTLislt}[2]{% \TE@throw\noexpand\dtl@testlt{#1}{#2}\noexpand\if@dtl@condition }</pre>
<code>\dtl@testiclt</code>	Command to test if first argument is less than second argument. If either argument is a string, a case insensitive string comparison is used instead. This sets <code>\if@dtl@condition</code> . <pre>\newcommand*\dtl@testiclt}[2]{% \@sDTLiflt{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}% }</pre>
<code>\DTLisilt</code>	Provide conditional command for use in <code>\ifthenelse</code> <pre>\newcommand*\DTLisilt}[2]{% \TE@throw\noexpand\dtl@testiclt{#1}{#2}\noexpand\if@dtl@condition }</pre>
<code>\dtl@testgt</code>	Command to test if first argument is greater than second argument. This sets <code>\if@dtl@condition</code> . <pre>\newcommand*\dtl@testgt}[2]{% \DTLifgt{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}% }</pre>
<code>\DTLisgt</code>	Provide conditional command for use in <code>\ifthenelse</code> <pre>\newcommand*\DTLisgt}[2]{% \TE@throw\noexpand\dtl@testgt{#1}{#2}\noexpand\if@dtl@condition }</pre>
<code>\dtl@testicgt</code>	Command to test if first argument is greater than second argument (ignores case). This sets <code>\if@dtl@condition</code> . <pre>\newcommand*\dtl@testicgt}[2]{% \@sDTLifgt{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}% }</pre>

`\DTLisigt` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisigt}[2]{%
  \TE@throw\noexpand\dtl@testicgt{#1}{#2}\noexpand\if@dtl@condition
}

```

`\dtl@testeq` Command to test if first argument is equal to the second argument. This sets `\if@dtl@condition`.

```

\newcommand*\dtl@testeq}[2]{%
  \DTLifeq{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

`\DTLiseq` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLiseq}[2]{%
  \TE@throw\noexpand\dtl@testeq{#1}{#2}\noexpand\if@dtl@condition
}

```

`\dtl@testiceq` Command to test if first number is equal to the second number (ignores case). This sets `\if@dtl@condition`.

```

\newcommand*\dtl@testiceq}[2]{%
  \@sDTLifeq{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

`\DTLisieq` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisieq}[2]{%
  \TE@throw\noexpand\dtl@testiceq{#1}{#2}\noexpand\if@dtl@condition
}

```

`\DTLisSubString` Tests if second argument is contained in first argument.

```

\newcommand*\DTLisSubString}[2]{%
  \TE@throw\noexpand\dtl@testifsubstring{#1}{#2}%
  \noexpand\if@dtl@condition
}

```

`\DTLisPrefix` Tests if first argument starts with second argument.

```

\newcommand*\DTLisPrefix}[2]{%
  \TE@throw\noexpand\dtl@teststartswith{#1}{#2}%
  \noexpand\if@dtl@condition
}

```

`\testnumclosedbetween` Command to test if first number lies between second and third numbers. (End points included, all arguments are fixed point numbers in standard format.) This sets `\if@dtl@condition`.

```

\newcommand*\dtl@testnumclosedbetween}[3]{%
  \DTLifnumclosedbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

Provide conditional command for use in `\ifthenelse`

`\DTLisnumclosedbetween`

```
\newcommand*{\DTLisnumclosedbetween}[3]{%
  \TE@throw\noexpand\dtl@testnumclosedbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}
```

`\DTLtestnumopenbetween`

Command to test if first number lies between second and third numbers. (End points excluded, all arguments are fixed point numbers in standard format.) This sets `\if@dtl@condition`.

```
\newcommand*{\dtl@testnumopenbetween}[3]{%
  \DTLifnumopenbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}
```

`\DTLisnumopenbetween`

Provide conditional command for use in `\ifthenelse`

```
\newcommand*{\DTLisnumopenbetween}[3]{%
  \TE@throw\noexpand\dtl@testnumopenbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}
```

`\DTLtestclosedbetween`

Command to test if first value lies between second and third values. (End points included, case sensitive.) This sets `\if@dtl@condition`.

```
\newcommand*{\dtl@testclosedbetween}[3]{%
  \DTLifclosedbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}
```

`\DTLisclosedbetween`

Provide conditional command for use in `\ifthenelse`

```
\newcommand*{\DTLisclosedbetween}[3]{%
  \TE@throw\noexpand\dtl@testclosedbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}
```

`\DTLtesticlosedbetween`

Command to test if first value lies between second and third values. (End points included, case ignored.) This sets `\if@dtl@condition`.

```
\newcommand*{\dtl@testiclosedbetween}[3]{%
  \@sDTLifclosedbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}
```

`\DTLisiclosedbetween`

Provide conditional command for use in `\ifthenelse`

```
\newcommand*{\DTLisiclosedbetween}[3]{%
  \TE@throw\noexpand\dtl@testiclosedbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}
```

`dtl@testopenbetween` Command to test if first value lies between second and third values. (End points excluded, case sensitive.) This sets `\if@dtl@condition`.

```

\newcommand*{\dtl@testopenbetween}[3]{%
  \DTLifopenbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

`\DTLisopenbetween` Provide conditional command for use in `\ifthenelse`

```

\newcommand*{\DTLisopenbetween}[3]{%
  \TE@throw\noexpand\dtl@testopenbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}

```

`dtl@testiopenbetween` Command to test if first value lies between second and third values. (End points excluded, case ignored.) This sets `\if@dtl@condition`.

```

\newcommand*{\dtl@testiopenbetween}[3]{%
  \@sDTLifopenbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

`\DTLisiopenbetween` Provide conditional command for use in `\ifthenelse`

```

\newcommand*{\DTLisiopenbetween}[3]{%
  \TE@throw\noexpand\dtl@testiopenbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}

```

`DTLisFPclosedbetween` Keep old command name for backwards compatibility:

```

\let\DTLisFPclosedbetween\DTLisnumclosedbetween

```

`dtl@testFPopenbetween` Command to test if first number lies between second and third numbers. (End points excluded, all arguments are fixed point numbers in standard format.) This sets `\if@dtl@condition`.

```

\newcommand*{\dtl@testFPopenbetween}[3]{%
  \DTLifFPopenbetween{#1}{#2}{#3}%
  {\@dtl@conditiontrue}{\@dtl@conditionfalse}%
}

```

`\DTLisFPopenbetween` Provide conditional command for use in `\ifthenelse`

```

\newcommand*{\DTLisFPopenbetween}[3]{%
  \TE@throw\noexpand\dtl@testFPopenbetween{#1}{#2}{#3}%
  \noexpand\if@dtl@condition
}

```

`\dtl@testFPislt` Command to test if first number is less than second number where both numbers are in standard format. This sets `\if@dtl@condition`.

```

\newcommand*{\dtl@testFPislt}[2]{%
  \dtlifnumlt{#1}{#2}%
}

```

```

    {%
      \@dtl@conditiontrue
    }%
    {%
      \@dtl@conditionfalse
    }%
  }

```

`\DTLisFP1t` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisFP1t}[2]{%
  \TE@throw\noexpand\dtl@testFPislt{#1}{#2}%
  \noexpand\if@dtl@condition
}

```

`\dtl@testFPisgt` Command to test if first number is greater than second number where both numbers are in standard format. This sets `\if@dtl@condition`.

```

\newcommand*\dtl@testFPisgt}[2]{%
  \dtlifnumgt{#1}{#2}%
  {%
    \@dtl@conditiontrue
  }%
  {%
    \@dtl@conditionfalse
  }%
}

```

`\DTLisFPgt` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisFPgt}[2]{%
  \TE@throw\noexpand\dtl@testFPisgt{#1}{#2}%
  \noexpand\if@dtl@condition
}

```

`\dtl@testFPiseq` Command to test if two numbers are equal, where both numbers are in standard decimal format

```

\newcommand*\dtl@testFPiseq}[2]{%
  \dtlifnumeq{#1}{#2}%
  {%
    \@dtl@conditiontrue
  }%
  {%
    \@dtl@conditionfalse
  }%
}

```

`\DTLisFPeq` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisFPeq}[2]{%
  \TE@throw\noexpand\dtl@testFPiseq{#1}{#2}%
  \noexpand\if@dtl@condition
}

```

`\dtl@testFPislteq` Command to test if first number is less than or equal to second number where both numbers are in standard format. This sets `\if@dtl@condition`.

```
\newcommand*\dtl@testFPislteq}[2]{%
\dtlifnumlt{#1}{#2}%
{%
\@dtl@conditiontrue
}%
{%
\@dtl@conditionfalse
}%
\if@dtl@condition
\else
\dtl@testFPiseq{#1}{#2}%
\fi
}
```

`\DTLisFPlteq` Provide conditional command for use in `\ifthenelse`

```
\newcommand*\DTLisFPlteq}[2]{%
\TE@throw\noexpand\dtl@testFPislteq{#1}{#2}%
\noexpand\if@dtl@condition
}
```

`\dtl@testFPisgteq` Command to test if first number is greater than or equal to second number where both numbers are in standard format. This sets `\if@dtl@condition`.

```
\newcommand*\dtl@testFPisgteq}[2]{%
\dtlifnumgt{#1}{#2}%
{%
\@dtl@conditiontrue
}%
{%
\@dtl@conditionfalse
}%
\if@dtl@condition
\else
\dtl@testFPiseq{#1}{#2}%
\fi
}
```

`\DTLisFPgteq` Provide conditional command for use in `\ifthenelse`

```
\newcommand*\DTLisFPgteq}[2]{%
\TE@throw\noexpand\dtl@testFPisgteq{#1}{#2}%
\noexpand\if@dtl@condition
}
```

`\dtl@teststring` Command to test if argument is a string. This sets `\if@dtl@condition`

```
\newcommand*\dtl@teststring}[1]{%
\DTLifstring{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}
```

`\DTLisstring` Provide conditional command for use in `\ifthenelse`

```

\newcommand*\DTLisstring}[1]{%
  \TE@throw\noexpand\dtl@teststring{#1}\noexpand\if@dtl@condition}

\dtl@testnumerical Command to test if argument is a numerical. This sets \if@dtl@condition
  \newcommand*\dtl@testnumerical}[1]{%
    \DTLifnumerical{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}%
  }

\DTLisnumerical Provide conditional command for use in \ifthenelse
  \newcommand*\DTLisnumerical}[1]{%
    \TE@throw\noexpand\dtl@testnumerical{#1}\noexpand\if@dtl@condition}

\dtl@testint Command to test if argument is an integer. This sets \if@dtl@condition
  \newcommand*\dtl@testint}[1]{%
    \DTLifint{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}

\DTLisint Provide conditional command for use in \ifthenelse
  \newcommand*\DTLisint}[1]{%
    \TE@throw\noexpand\dtl@testint{#1}\noexpand\if@dtl@condition}

\dtl@testreal Command to test if argument is a real. This sets \if@dtl@condition
  \newcommand*\dtl@testreal}[1]{%
    \DTLifreal{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}

\DTLisreal Provide conditional command for use in \ifthenelse
  \newcommand*\DTLisreal}[1]{%
    \TE@throw\noexpand\dtl@testreal{#1}\noexpand\if@dtl@condition}

\dtl@testcurrency Command to test if argument is a currency. This sets \if@dtl@condition
  \newcommand*\dtl@testcurrency}[1]{%
    \DTLifcurrency{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}

\DTLiscurrency Provide conditional command for use in \ifthenelse
  \newcommand*\DTLiscurrency}[1]{%
    \TE@throw\noexpand\dtl@testcurrency{#1}\noexpand\if@dtl@condition}

\dtl@testcurrencyunit Command to test if argument is a currency with given unit. This sets \if@dtl@condition
  \newcommand*\dtl@testcurrencyunit}[2]{%
    \DTLifcurrencyunit{#1}{#2}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}

\DTLiscurrencyunit Provide conditional command for use in \ifthenelse
  \newcommand*\DTLiscurrencyunit}[2]{%
    \TE@throw\noexpand\dtl@testcurrencyunit{#1}{#2}%
    \noexpand\if@dtl@condition
  }

```

1.7 Loops

`\dtlbreak` Break out of loop at the end of current iteration.

```
\newcommand*\dtlbreak{%
  \PackageError{datatool}{Can't break out of anything}{}%
}
```

`\dtlforint` `\dtlforint<ct>=<start>\to<end>\step <inc>\do{<body>}`

`<ct>` is a count register, `<start>`, `<end>` and `<inc>` are integers. Group if nested or use `\dtlglforint`. An infinite loop may result if `<inc>=0` and `<start> ≤ <end>` and `\dtlbreak` isn't used.

```
\long\def\dtlforint#1=#2\to#3\step#4\do#5{%
```

Make a copy of old version of break function

```
\let\@dtl@orgbreak\dtlbreak
\def\@dtl@endloophook{}%
```

Setup break function for the loop (sets `<ct>` to `<end>` at the end of the current iteration).

```
\def\dtlbreak{\def\@dtl@endloophook{#1=#3}}%
```

Initialise `<ct>`

```
#1=#2\relax
```

Check if the steps are positive or negative.

```
\ifnum#4<0\relax
```

Counting down

```
\whiledo{ \(#1>#3\)\TE@or\(#1=#3\)}%
{%
  #5%
  \@dtl@endloophook
  \advance#1 by #4\relax
}%
\else
```

Counting up

```
\whiledo{ \(#1<#3\)\TE@or\(#1=#3\)}%
{%
  #5%
  \@dtl@endloophook
  \advance#1 by #4\relax
}%
\fi
```

Restore break function.

```
\let\dtlbreak\@dtl@orgbreak
}
```


`\@dtl@foreach@level` Count register to keep track of global nested loops.

`\newcount\@dtl@foreach@level`

`\dtlforint` `\dtlforint<ct>=<start>\to<end>\step <inc>\do{<body>}`

`<ct>` is a count register, `<start>`, `<end>` and `<inc>` are integers. An infinite loop may result if `<inc>=0` and `<start> ≤ <end>` and `\dtlbreak` isn't used.

`\long\def\dtlforint#1=#2\to#3\step#4\do#5{%`

Initialise

`\global#1=#2\relax`

Increment level counter to allow for nested loops

`\global\advance\@dtl@foreach@level by 1\relax`

Set up end loop hook

`\expandafter\global\expandafter`

`\let\csname @dtl@endhook@\the\@dtl@foreach@level\endcsname`

`\relax`

Set up the break function: Copy current definition

`\expandafter\global\expandafter`

`\let\csname @dtl@break@\the\@dtl@foreach@level\endcsname`

`\dtlbreak`

Set up definition for this level (sets `<ct>` to `<end>` at the end of the current iteration).

`\gdef\dtlbreak{\expandafter`

`\gdef\csname @dtl@endhook@\the\@dtl@foreach@level\endcsname{%`
`#1=#3}}%`

check the direction

`\ifnum#4<0\relax`

Counting down

`\whiledo{(\#1>\#3)\TE@or{(\#1=\#3)}}%`

`{%`

`#5%`

`\csname @dtl@endhook@\the\@dtl@foreach@level\endcsname`

`\global\advance#1 by #4\relax`

`}%`

`\else`

Counting up (or 0 increments)

`\whiledo{(\#1<\#3)\TE@or{(\#1=\#3)}}%`

`{%`

`#5%`

`\csname @dtl@endhook@\the\@dtl@foreach@level\endcsname`

`\global\advance#1 by #4\relax`

`}%`

`\fi`

Restore break function

```
\expandafter\global\expandafter\let\expandafter\dtlbreak
\csname @dtl@break@\the\@dtl@foreach@level\endcsname
```

Decrement level counter

```
\global\advance\@dtl@foreach@level by -1\relax
}
```

dtlenvgforint Environment form (contents are gathered, so verbatim can't be used):

```
\newenvironment{dtlenvgforint}[1]%
{%
  \def\@dtlenvgforint@arg{#1}%
  \long@collect@body\@do@dtlenvgforint
}%
{}
\newcommand{\@do@dtlenvgforint}[1]{%
  \expandafter\dtlgforint\@dtlenvgforint@arg\do{#1}%
}
```

2 datatool-fp.sty

Definitions of fixed-point commands that use the fp package.

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{datatool-fp}[2012/07/18 v2.10 (NLCT)]
```

Required packages:

```
\RequirePackage{xkeyval}
\RequirePackage{fp}
\RequirePackage{datatool-base}
```

`verbose` Switch fp messages on or off

```
\define@choicekey{datatool-fp}{verbose}[\val\nr]{true,false}[true]{%
  \ifcase\nr\relax
    \FPmessagestrue
  \or
    \FPmessagesfalse
  \fi
}
\let\ifFPmessages\ifdtlverbose
```

Process package options:

```
\ProcessOptionsX
```

Define commands that are needed before loading datatool-base:

```
\providecommand*\@dtl@mathprocessor}{fp}
```

`\dtlifnumeq` `\dtlifnumeq{⟨num1⟩}{⟨num2⟩}{⟨true part⟩}{⟨false part⟩}`

Does *⟨true part⟩* if *⟨num1⟩=⟨num2⟩*, otherwise does *⟨false part⟩*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*\dtlifnumeq[4]{%
  \FPifeq{#1}{#2}%
    #3%
  \else
    #4%
  \fi
}
```

If `verbose` option set, switch on `verbose` for `datatool-base` as well:

```
\let\ifdtlverbose\ifFPmessages
```

2.1 Comparison Commands

`\dtlifnumlt` `\dtlifnumlt{⟨num1⟩}{⟨num2⟩}{⟨true part⟩}{⟨false part⟩}`

Does *⟨true part⟩* if $\langle num1 \rangle < \langle num2 \rangle$, otherwise does *⟨false part⟩*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*\dtlifnumlt}[4]{%
  \FPiflt{#1}{#2}%
    #3%
  \else
    #4%
  \fi
}
```

`\dtlifnumgt` `\dtlifnumgt{⟨num1⟩}{⟨num2⟩}{⟨true part⟩}{⟨false part⟩}`

Does *⟨true part⟩* if $\langle num1 \rangle > \langle num2 \rangle$, otherwise does *⟨false part⟩*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*\dtlifnumgt}[4]{%
  \FPifgt{#1}{#2}%
    #3%
  \else
    #4%
  \fi
}
```

`\dtlifnumopenbetween` `\dtlifnumopenbetween{⟨num⟩}{⟨min⟩}{⟨max⟩}{⟨true part⟩}{⟨false part⟩}`

Determines if $\langle min \rangle < \langle num \rangle < \langle max \rangle$ where all arguments are in standard fixed point notation.

```
\newcommand*\dtlifnumopenbetween}[5]{%
  \let\@dtl@dovalue\relax
  \dtlifnumgt{#1}{#2}%
  {}%
  {%
    \def\@dtl@dovalue{#5}%
  }%
  \dtlifnumlt{#1}{#3}%
  {%
    \ifx\@dtl@dovalue\relax
      \def\@dtl@dovalue{#4}%
    \fi
  }%
}
```

```
{%
  \def\@dtl@dovalue{#5}%
}%
\@dtl@dovalue
}
```

dtlifnumclosedbetween

```
\dtlifnumclosedbetween{<num>}{<min>}{<max>}{<true part>}{<false
part>}
```

Determines if $\langle min \rangle \leq \langle num \rangle \leq \langle max \rangle$ where all arguments are in standard fixed point notation.

```
\newcommand*{\dtlifnumclosedbetween}[5]{%
  \let\@dtl@dovalue\relax
  \dtlifnumgt{#1}{#2}%
  {%
  {%
    \dtlifnumeq{#1}{#2}%
    {%
      \def\@dtl@dovalue{#4}%
    }%
    {%
      \def\@dtl@dovalue{#5}%
    }%
  }%
  \dtlifnumlt{#1}{#3}%
  {%
    \ifx\@dtl@dovalue\relax
      \def\@dtl@dovalue{#4}%
    \fi
  }%
  {%
    \dtlifnumeq{#1}{#3}%
    {%
      \def\@dtl@dovalue{#4}%
    }%
    {%
      \def\@dtl@dovalue{#5}%
    }%
  }%
  \@dtl@dovalue
}
```

2.2 Functions

`\dtladd` Adds two numbers using fp.

```
\newcommand*{\dtladd}[3]{%
  \FPadd{#1}{#2}{#3}%
}
```

```

    }

\dtlsub Subtracts two numbers using fp.
    \newcommand*\dtlsub}[3]{%
        \FPsub{#1}{#2}{#3}%
    }

\dtlmul Multiplies two numbers using fp.
    \newcommand*\dtlmul}[3]{%
        \FPMul{#1}{#2}{#3}%
    }

\dtldiv Divides two numbers using fp.
    \newcommand*\dtldiv}[3]{%
        \FPdiv{#1}{#2}{#3}%
    }

\dtlroot Square root using fp.
    \newcommand*\dtlroot}[2]{%
        \FProot{#1}{#2}%
    }

\dtlround Rounds using fp.
    \newcommand*\dtlround}[3]{%
        \FPround{#1}{#2}{#3}%
    }

\dtltrunc Truncates using fp. (Third argument is the number of digits.)
    \newcommand*\dtltrunc}[3]{%
        \FPtrunc{#1}{#2}{#3}%
    }

\dtlclip
    \newcommand*\dtlclip}[2]{%
        \FPclip{#1}{#2}%
    }

\dtlmin Minimum of two numbers using fp.
    \newcommand*\dtlmin}[3]{%
        \FPmin{#1}{#2}{#3}%
    }

\dtlmax Maximum of two numbers using fp.
    \newcommand*\dtlmax}[3]{%
        \FPmax{#1}{#2}{#3}%
    }

```

```
\dtlabs Absolute value using fp.
\newcommand*\dtlabs[2]{%
  \FPabs{#1}{#2}%
}
```

```
\dtlneg Negative of a value using fp.
\newcommand*\dtlneg[2]{%
  \FPneg{#1}{#2}%
}
```

3 datatool-pgfmath.sty

Definitions of fixed-point commands that use the pgfmath package.

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{datatool-pgfmath}[2012/07/18 v2.10 (NLCT)]
```

Required packages:

```
\RequirePackage{xkeyval}
\RequirePackage{pgfrcs,pgfkeys,pgfmath}
```

Process package options:

```
\ProcessOptionsX
```

Define commands that are needed before loading datatool-base:

```
\providecommand*\@dtl@mathprocessor{pgfmath}
```

```
\dtlifnumeq \dtlifnumeq{<num1>}{<num2>}{<true part>}{<false part>}
```

Does *<true part>* if $\langle num1 \rangle = \langle num2 \rangle$, otherwise does *<false part>*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*\dtlifnumeq[4]{%
  \pgfmathifthenelse{#1==#2}{"#3"}{"#4"}%
  \pgfmathresult
}
```

Load base package:

```
\RequirePackage{datatool-base}
```

3.1 Comparison Commands

```
\dtlifnumlt \dtlifnumlt{<num1>}{<num2>}{<true part>}{<false part>}
```

Does *<true part>* if $\langle num1 \rangle < \langle num2 \rangle$, otherwise does *<false part>*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*\dtlifnumlt[4]{%
  \pgfmathifthenelse{#1 < #2}{"#3"}{"#4"}%
  \pgfmathresult
}
```


`\dtlifnumgt` `\dtlifnumgt{<num1>}{<num2>}{<true part>}{<false part>}`

Does *<true part>* if *<num1>* $>$ *<num2>*, otherwise does *<false part>*. The numbers must use a full stop as the decimal character and no number group separator.

```
\newcommand*{\dtlifnumgt}[4]{%
  \pgfmathifthenelse{#1 > #2}{"#3"}{"#4"}%
  \pgfmathresult
}
```

`\dtlifnumopenbetween` `\dtlifnumopenbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}`

Determines if *<min>* $<$ *<num>* $<$ *<max>* where all numerical arguments are in standard fixed point notation.

```
\newcommand*{\dtlifnumopenbetween}[5]{%
  \pgfmathifthenelse{(#2 < #1) && (#1 < #3)}{"#4"}{"#5"}%
  \pgfmathresult
}
```

`\dtlifnumclosedbetween` `\dtlifnumclosedbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}`

Determines if *<min>* \leq *<num>* \leq *<max>* where all numerical arguments are in standard fixed point notation.

```
\newcommand*{\dtlifnumclosedbetween}[5]{%
  \pgfmathifthenelse{(#2 <= #1) && (#1 <= #3)}{"#4"}{"#5"}%
  \pgfmathresult
}
```

3.2 Functions

`\dtladd` Adds two numbers using PGF math engine.

```
\newcommand*{\dtladd}[3]{%
  \pgfmathadd{#2}{#3}%
  \let#1\pgfmathresult
}
```

`\dtlsub` Subtracts two numbers using PGF math engine.

```
\newcommand*{\dtlsub}[3]{%
  \pgfmathsubtract{#2}{#3}%
  \let#1\pgfmathresult
}
```

`\dtlmul` Multiplies two numbers using PGF math engine.

```

\newcommand*\dtlmul}[3]{%
  \pgfmathmultiply{#2}{#3}%
  \let#1\pgfmathresult
}

```

`\dtldiv` Divides two numbers using PGF math engine.

```

\newcommand*\dtldiv}[3]{%
  \pgfmathdivide{#2}{#3}%
  \let#1\pgfmathresult
}

```

`\dtlroot` Square root using PGF math engine.

```

\newcommand*\dtlroot}[2]{%
  \pgfmathsqrt{#2}%
  \let#1\pgfmathresult
}

```

`\dtlround` Rounds using PGF math engine.

```

\newcommand*\dtlround}[3]{%
  \pgfmathparse{10^#3}%
  \let\dtl@tmpshift\pgfmathresult
  \pgfmathparse{round(#2 * \dtl@tmpshift) / \dtl@tmpshift}%
  \let#1\pgfmathresult
}

```

`\dtltrunc` Truncates using PGF math engine. (Third argument is the number of digits.)

```

\newcommand*\dtltrunc}[3]{%
  \pgfmathparse{10^#3}%
  \let\dtl@tmpshift\pgfmathresult
  \pgfmathparse{floor(#2 * \dtl@tmpshift) / \dtl@tmpshift}%
  \let#1\pgfmathresult
}

```

`\dtlclip` There isn't a clip in pgfmath as it seems to automatically clip.

```

\newcommand*\dtlclip}[2]{%
  \edef#1{#2}%
}

```

`\dtlmin` Minimum of two numbers using PGF math engine.

```

\newcommand*\dtlmin}[3]{%
  \pgfmathmin{#2}{#3}%
  \let#1\pgfmathresult
}

```

`\dtlmax` Maximum of two numbers using PGF math engine.

```

\newcommand*\dtlmax}[3]{%
  \pgfmathmax{#2}{#3}%
}

```

```

        \let#1\pgfmathresult
    }

\dtlabs Absolute value using PGF math engine.
    \newcommand*\dtlabs[2]{%
        \pgfmathabs{#2}%
        \let#1\pgfmathresult
    }

\dtlneg Negative of a value using PGF math engine.
    \newcommand*\dtlneg[2]{%
        \pgfmathmul{-1}{#2}%
        \let#1\pgfmathresult
    }

```

4 datatool.sty

4.1 Package Declaration

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{datatool}[2012/07/18 v2.10 (NLCT)]
```

Load required packages:

```
\RequirePackage{xkeyval}
\RequirePackage{ifthen}
\RequirePackage{xfor}
\RequirePackage{substr}
\RequirePackage{etex}
```

4.2 Package Options

`\@dtl@separator` The data separator character (comma by default) is stored in `\@dtl@separator`. This is the separator used in external data files, not in the \TeX code, which always uses a comma separator.

```
\newcommand*{\@dtl@separator}{,}
```

`\DTLsetseparator` `\DTLsetseparator{<char>}`

The sets `\@dtl@separator`, and constructs the relevant macros that require this character to be hardcoded into their definition.

```
\newcommand*{\DTLsetseparator}[1]{%
  \renewcommand*{\@dtl@separator}{#1}%
  \@dtl@construct@lopoffs
}
```

`\DTLsettabseparator` `\DTLsettabseparator` makes it easier to set a tab separator.

```
\begingroup
\catcode'\^^I12
\gdef\DTLsettabseparator{%
  \catcode'\^^I12
  \DTLsetseparator{^^I}%
}
\endgroup
```

`\@dtl@delimiter` The data delimiter character (double quote by default) is stored in `\@dtl@delimiter`. This is used in external data files, not in the \TeX code.

```

\beginngroup
\catcode'\ "12\relax
\gdef\@dtl@delimiter{"}
\endgroup

```

\DTLsetdelimiter \DTLsetdelimiter{<char>}

This sets the delimiter.

```

\newcommand*\DTLsetdelimiter[1]{%
  \renewcommand*\@dtl@delimiter}{#1}%
  \@dtl@construct@lopoffs
}

```

@dtl@construct@lopoff \@dtl@construct@lopoff<separator char><delimiter char>

This defines

\@dtl@lopoff<first element><sep><rest of list>\to<cmd1><cmd2>

for the current separator and delimiter.

```

\edef\@dtl@construct@lopoff#1#2{%
  \noexpand\long
  \noexpand\def\noexpand\@dtl@lopoff#1##1##2\noexpand\to##3##4{%
    \noexpand\ifx#2##1\noexpand\relax
    \noexpand\@dtl@qlopoff#1##1##2\noexpand\to##3##4\relax
  \noexpand\else
    \noexpand\@dtl@lop@ff#1##1##2\noexpand\to##3##4\relax
  \noexpand\fi
}%
}

```

@dtl@construct@qlopoff \@dtl@construct@qlopoff<separator char><delimiter char>

This constructs \@dtl@qlopoff to be used when the entry is surrounded by the current delimiter value.

```

\edef\@dtl@construct@qlopoff#1#2{%
  \noexpand\long
  \noexpand\def\noexpand\@dtl@qlopoff#1#2##1#2#1##2\noexpand\to##3##4{%
    \noexpand\def##4{##1}%

```

Replace any escaped delimiters

```

\noexpand\DTLsubstituteall{##4}{#2#2}{#2}%
\noexpand\edef\noexpand\@dtl@dosubs{%
  \noexpand\noexpand\noexpand\DTLsubstituteall{\noexpand\noexpand##4}%
  {\noexpand\expandafter\noexpand\noexpand\noexpand\curname#2\noexpand\endcurname#2}%
}

```

```

        {\noexpand\expandafter\noexpand\noexpand\noexpand\csname#2\noexpand\endcsname}%
    }%
    \noexpand\@dtl@dsubs
    \noexpand\def##3{#1##2}%
  }%
}

```

dtl@construct@lop@ff

```
\@dtl@construct@lop@ff<separator char>
```

This constructs \@dtl@lop@ff to be used when the entry isn't surrounded by the delimiter.

```

\edef\@dtl@construct@lop@ff#1{%
  \noexpand\long
  \noexpand\def\noexpand\@dtl@lop@ff#1##1#1##2\noexpand\to##3##4{%
    \noexpand\def##4{##1}%
    \noexpand\def##3{#1##2}%
  }%
}

```

dtl@construct@lop@ffs

```
\@dtl@construct@lop@ffs
```

This constructs all the lopoff macros using the given separator and delimiter characters.

```

\newcommand{\@dtl@construct@lop@ffs}{%
  \edef\@dtl@chars{\@dtl@separator}\@dtl@delimiter}%
  \expandafter\@dtl@construct@lop@ff\@dtl@chars
  \expandafter\@dtl@construct@lop@ff\@dtl@chars
  \expandafter\@dtl@construct@lop@ff\expandafter{\@dtl@separator}%
}

```

separator Define separator used in external data files.

```

\define@key{datatool.sty}{separator}{%
  \DTLsetseparator{#1}%
}

```

delimiter Define delimiter used in external data files.

```

\define@key{datatool.sty}{delimiter}{%
  \DTLsetdelimiter{#1}%
}

```

verbose

```
\define@boolkey{datatool.sty}[dtl]{verbose}[true]{}

```

math Determine whether to use fp or pgfmath for the arithmetic commands. The default is to use fp.

```

\define@choicekey{datatool.sty}{math}[\val\nr]{fp,pgfmath}{%
  \renewcommand*\@dtl@mathprocessor{#1}%
}
\newcommand*\@dtl@mathprocessor}{fp}

```

Process package options:

```
\ProcessOptionsX
```

Set the defaults:

```
\@dtl@construct@lopoffs
```

Load base package:

```
\RequirePackage{datatool-base}
```

`\DTLpar` Many of the commands used by this package are short commands. This means that you can't use `\par` in the data. To get around this, define the robust command `\DTLpar` to use instead.

```
\DeclareRobustCommand\DTLpar{\@par}
```

4.3 Defining New Databases

As from v2.0, the internal structure of the database has changed to make it more efficient.¹ The database is now stored in a token register instead of a macro. Each row is represented as:

```

\db@row@elt@w \db@row@id@w <row idx>\db@row@id@end@ <column data>
\db@row@id@w <row idx>\db@row@id@end@ \db@row@elt@end@

```

where `<row idx>` is the row index and `<column data>` is the data for each column in the row. Each column for a given row is stored as:

```

\db@col@id@w <column idx>\db@col@id@end@ \db@col@elt@w <value>\db@col@elt@end@
\db@col@id@w <column idx>\db@col@id@end@

```

where `<column idx>` is the column index and `<value>` is the entry for the given column and row.

Each row only has an associated index, but columns have a unique identifying key as well as an associated index. Columns also have an associated data type which may be: 0 (column contains strings), 1 (column contains integers), 2 (column contains real numbers), 3 (column contains currency) or `<empty>` (column contains no data). Since the key sometimes has to be expanded, a header is also available in the event that the user wants to use `\DTLdisplaydb` or `\DTLdisplaylongdb` and requires a column header that would cause problems if used as a key. The general column information is stored in a token register where each column has information stored in the form:

```

\db@plist@elt@w \db@col@id@w <index>\db@col@id@end@ \db@key@id@w
<key>\db@key@id@end@ \db@type@id@w <type>\db@type@id@end@ \db@header@id@w
<type>\db@header@id@end@ \db@col@id@w <index>\db@col@id@end@ \db@plist@elt@end@

```

¹Thanks to Morten Høgholm for the suggestion.

The column name (*<key>*) is mapped to the column index using `\dtl@ci@<db>@<key>` where *<db>* is the database name.

`\DTLnewdb` `\DTLnewdb{<db name>}`

Initialises a database called *<name>*.

```
\newcommand*{\DTLnewdb}[1]{%
```

Check if there is already a database with this name.

```
\DTLifdbexists{#1}%
{%
  \PackageError{datatool}{Database ‘#1’ already exists}{}%
}%
{%
```

Define new database. Add information message if in verbose mode.

```
\dtl@message{Creating database ‘#1’}%
```

Define token register used to store the contents of the database.

```
\expandafter\newtoks\csname dtldb@#1\endcsname
```

Define token register used to store the column header information.

```
\expandafter\newtoks\csname dtlkeys@#1\endcsname{}%
```

Define count register used to store the row count.

```
\expandafter\newcount\csname dtlrows@#1\endcsname
```

Define count register used to store the column count.

```
\expandafter\newcount\csname dtlcols@#1\endcsname
}%
}
```

`\DTLcleardb` `\DTLcleardb{<db name>}`

Clears the database. (Makes it empty, but still defined.)

```
\newcommand*{\DTLcleardb}[1]{%
\DTLifdbexists{#1}%
{%
  \dtlforeachkey(\@dtl@key,\@dtl@col,\@dtl@type,\@dtl@head)\in{#1}\do
  {%
    \expandafter\let\csname dtl@ci@#1@%dtl@key\endcsname\undefined
  }%
  \csname dtldb@#1\endcsname{}%
  \csname dtlkeys@#1\endcsname{}%
  \csname dtlrows@#1\endcsname=0\relax
  \csname dtlcols@#1\endcsname=0\relax
}%
{%
```



```

        \PackageError{Can't clear database '#1':
            database doesn't exist}{-}{-}%
    }%
}

```

`\DTLdeletedb` `\DTLdeletedb{<db name>}`

Deletes a database.

```

\newcommand*{\DTLdeletedb}[1]{%
    \DTLifdbexists{#1}%
    {%
        \dtlforeachkey(\@dtl@key,\@dtl@col,\@dtl@type,\@dtl@head)\in{#1}\do
        {%
            \expandafter\let\csname dtl@ci@#1@\@dtl@key\endcsname\undefined
        }%
        \expandafter\let\csname dtldb@#1\endcsname\undefined
        \expandafter\let\csname dtlkeys@#1\endcsname\undefined
        \expandafter\let\csname dtlrows@#1\endcsname\undefined
        \expandafter\let\csname dtlcols@#1\endcsname\undefined
    }%
    {%
        \PackageError{Can't delete database '#1':
            database doesn't exist}{-}{-}%
    }%
}

```

`\DTLrowcount` `\DTLrowcount{<db name>}`

The number of rows in the database called <db name>. (Doesn't check if database exists.)

```

\newcommand*{\DTLrowcount}[1]{%
    \expandafter\number\csname dtlrows@#1\endcsname
}

```

`\DTLcolumncount` `\DTLcolumncount{<db name>}`

The number of columns in the database called <db name>. (Doesn't check if database exists.)

```

\newcommand*{\DTLcolumncount}[1]{%
    \expandafter\number\csname dtlcols@#1\endcsname
}

```

`\DTLifdbempty` `\DTLifdbempty{<name>}{<true part>}{<false part>}`

Check if named database is empty (i.e. no rows have been added).

```
\newcommand{\DTLifdbempty}[3]{%
  \DTLifdbexists{#1}%
  {\@DTLifdbempty{#1}{#2}{#3}}%
  {\PackageError{Can't check if database '#1' is empty:
    database doesn't exist}{}}}%
}
```

`\@DTLifdbempty` `\@sDTLifdbempty{<name>}{<true part>}{<false part>}`

Check if named existing database is empty. (No check performed to determine if the database exists.)

```
\newcommand{\@DTLifdbempty}[3]{%
  \expandafter\ifnum\csname dtlrows@#1\endcsname=0\relax
  #2%
  \else
  #3%
  \fi
}
```

`\DTLnewrow` `\DTLnewrow{<db name>}`

Add a new row to named database. The starred version doesn't check for the existence of the database.

```
\newcommand*{\DTLnewrow}{%
  \@ifstar\@sDTLnewrow\DTLnewrow
}
```

`\@DTLnewrow` `\@DTLnewrow{<db name>}`

Add a new row to named database. (Checks for the existence of the database.)

```
\newcommand*{\@DTLnewrow}[1]{%
  \DTLifdbexists{#1}%
  {\@sDTLnewrow{#1}}%
  {\PackageErrors{datatool}{Can't add new row to database '#1':
    database doesn't exist}{}}%
}
```

`\@sDTLnewrow` `\@DTLnewrow{<db name>}`

Add a new row to named existing database. (No check performed to determine if the database exists.)

```
\newcommand*{\@sDTLnewrow}[1]{%
```

Increment row count.

```
\global\advance\csname dtlrows@#1\endcsname by 1\relax
```

Append an empty row to the database

```
\toks@gput@right@cx{dtldb@#1}{%
  \noexpand\db@row@elt@w%
    \noexpand\db@row@id@w \number\csname dtlrows@#1\endcsname
    \noexpand\db@row@id@end@%
    \noexpand\db@row@id@w \number\csname dtlrows@#1\endcsname
    \noexpand\db@row@id@end@%
  \noexpand\db@row@elt@end@%
}%
```

Display message on terminal and log file if in verbose mode.

```
\dtl@message{New row added to database '#1'}%
}
```

`\dtlcolumnnum` Count register to keep track of column index.

```
\newcount\dtlcolumnnum
```

`\dtlrownum` Count register to keep track of row index.

```
\newcount\dtlrownum
```

`\DTLifhaskey` `\DTLifhaskey<db name><key><true part><false part>`

Checks if the named database *<db name>* has a column with label *<key>*. If column exists, do *<true part>* otherwise do *<false part>*. The starred version doesn't check if the named database exists.

```
\newcommand*\DTLifhaskey{\@ifstar\@sDTLifhaskey\@DTLifhaskey}
```

`\@DTLifhaskey` Unstarred version of `\DTLifhaskey`

```
\newcommand{\@DTLifhaskey}[4]{%
  \DTLifdbexists{#1}%
  {%
    \@sDTLifhaskey{#1}{#2}{#3}{#4}%
  }%
  {%
    \PackageError{datatool}{Database '#1' doesn't exist}{}%
  }%
}
```

`\@sDTLifhaskey` Starred version of `\DTLifhaskey`

```
\newcommand{\@sDTLifhaskey}[4]{%
  \@ifundefined{dtl@ci@#1@#2}%
  {%
```

Key not defined

```
#4%
}%
{%
```

Key defined

```
#3%
}%
}
```

`\DTLgetcolumnindex` `\DTLgetcolumnindex{<cs>}{<db>}{<key>}`

Gets index for column with label *<key>* from database *<db>* and stores in *<cs>* which must be a control sequence. Unstarred version checks if database and key exist, unstarred version doesn't perform any checks.

```
\newcommand*\DTLgetcolumnindex{%
  \@ifstar\@sdtl@getcolumnindex\@dtl@getcolumnindex
}
```

`@dtl@getcolumnindex` Unstarred version of `\DTLgetcolumnindex`

```
\newcommand*\@dtl@getcolumnindex}[3]{%
```

Check if database exists.

```
\DTLifdbexists{#2}%
{%
```

Database exists. Now check if key exists.

```
\@sDTLifhaskey{#2}{#3}%
{%
```

Key exists so go ahead and get column index.

```
\@sdtl@getcolumnindex{#1}{#2}{#3}%
}%
{%
```

Key doesn't exist in named database.

```
\PackageError{datatool}{Database '#2' doesn't contain
key '#3'}{}}%
}%
}%
{%
```

Named database doesn't exist.

```
\PackageError{datatool}{Database '#2' doesn't exist}{}}%
}%
}
```

`@dtl@getcolumnindex` Starred version of `\DTLgetcolumnindex`.

```
\newcommand*\@sdtl@getcolumnindex}[3]{%
  \expandafter\let\expandafter#1\csname dtl@ci@#2@#3\endcsname
}
```

`\dtlcolumnindex` `\dtlcolumnindex{<db>}{<key>}`

Column index corresponding to *<key>* in database *<db>*. (No check for existence of database or key.)

```
\newcommand*{\dtlcolumnindex}[2]{%
  \csname dtl@ci@#1@#2\endcsname
}
```

`\DTLgetkeyforcolumn` `\DTLgetkeyforcolumn{<key cs>}{<db>}{<column index>}`

Gets the key associated with the given column index and stores in *<key cs>*. Unstarred version doesn't perform checks.

```
\newcommand*{\DTLgetkeyforcolumn}{%
  \@ifstar\@sdtlgetkeyforcolumn\@dtlgetkeyforcolumn}
```

`@dtlgetkeyforcolumn`

```
\newcommand*{\@dtlgetkeyforcolumn}[3]{%
  \DTLifdbexists{#2}%
  {%
```

Check if index is in range.

```
    \ifnum#3<1\relax
      \PackageError{datatool}{Invalid column index \number#3}{%
        Column indices start at 1}%
    \else
      \expandafter\ifnum\csname dtlcols@#2\endcsname<#3\relax
      \PackageError{datatool}{Index \number#3\space out of
        range for database '#2'}{Database '#2' only has
        \expandafter\number\csname dtlcols@#2\endcsname\space
        columns}%
      \else
        \@sdtlgetkeyforcolumn{#1}{#2}{#3}%
      \fi
    \fi
  }%
  {%
    \PackageError{datatool}{Database '#2' doesn't exists}{}%
  }%
}
```

`@sdtlgetkeyforcolumn` `\@sdtlgetkeyforcolumn{<key cs>}{<db>}{<column index>}`

Gets the key associated with the given column index and stores in *<key cs>*

```
\newcommand*{\@sdtlgetkeyforcolumn}[3]{%
  \edef\@dtl@dogetkeyforcolumn{\noexpand\@dtlgetkeyforcolumn
```

```

        {\noexpand#1}{#2}{\number#3}}%
\@dtl@dogetkeyforcolumn
}

```

dtl@getkeyforcolumn Column index must be fully expanded before use.

```

\newcommand*{\@dtl@getkeyforcolumn}[3]{%
  \def\@dtl@get@keyforcolumn##1% before stuff
    \db@plist@elt@w% start of block
    \db@col@id@w #3\db@col@id@end@% index
    \db@key@id@w ##2\db@key@id@end@% key
    \db@type@id@w ##3\db@type@id@end@% data type
    \db@header@id@w ##4\db@header@id@end@% header
    \db@col@id@w #3\db@col@id@end@% index
    \db@plist@elt@end@% end of block
    ##5\q@nil{\def#1{##2}}%
  \edef\@dtl@tmp{\expandafter\the\csname dtlkeys@#2\endcsname}%
  \expandafter\@dtl@get@keyforcolumn\@dtl@tmp
    \db@plist@elt@w% start of block
    \db@col@id@w #3\db@col@id@end@% index
    \db@key@id@w \@nil\db@key@id@end@% key
    \db@type@id@w \db@type@id@end@% data type
    \db@header@id@w \db@header@id@end@% header
    \db@col@id@w #3\db@col@id@end@% index
    \db@plist@elt@end@% end of block
    \q@nil
}

```

Define some commands to indicate the various data types a database may contain.

\DTLunsettype Unknown data type. (All entries in the column are blank so the type can't be determined.)

```
\def\DTLunsettype{}
```

\DTLstringtype Data type representing strings.

```
\def\DTLstringtype{0}
```

\DTLinttype Data type representing integers.

```
\def\DTLinttype{1}
```

\DTLrealtype Data type representing real numbers.

```
\def\DTLrealtype{2}
```

\DTLcurrencytype Data type representing currency.

```
\def\DTLcurrencytype{3}
```

\DTLgetdatatype \DTLgetdatatype{<cs>}{<db>}{<key>}

Gets data type associated with column labelled $\langle key \rangle$ in database $\langle db \rangle$ and stores in $\langle cs \rangle$. Type may be: $\langle empty \rangle$ (unset), 0 (string), 1 (int), 2 (real), 3 (currency). Unstarred version checks if the database and key exist, starred version doesn't.

```
\newcommand*\DTLgetdatatype{%
  \ifstar\sdtlgetdatatype\dtlgetdatatype
}
```

$\backslash\@dtlgetdatatype$ Unstarred version of $\backslash\DTLgetdatatype$.

```
\newcommand*\@dtlgetdatatype[3]{%
```

Check if database exists.

```
\DTLifdbexists{#2}%
{%
```

Check if key exists in this database.

```
\@sDTLifhaskey{#2}{#3}%
{%
```

Get data type for this database and key.

```
\@sdtlgetdatatype{#1}{#2}{#3}%
}%
{%
```

Key doesn't exist in this database.

```
\PackageError{datatool}{Key '#3' undefined in database '#2'}{}%
}%
}%
{%
```

Database doesn't exist.

```
\PackageError{datatool}{Database '#2' doesn't exist}{}%
}%
}
```

$\backslash\@sdtlgetdatatype$ Starred version of $\backslash\DTLgetdatatype$. This ensures that the key is fully expanded before begin passed to $\backslash\@dtl@getdatatype$.

```
\newcommand*\@sdtlgetdatatype[3]{%
  \edef\@dtl@dogetdata{\noexpand\@dtl@getdatatype\noexpand#1}%
  {\expandafter\the\csname dtlkeys@#2\endcsname}%
  {\dtlcolumnindex{#2}{#3}}}%
  \@dtl@dogetdata
}
```

$\backslash\@dtl@getdatatype$ $\backslash\@dtl@getdatatype\{ \langle cs \rangle \} \{ \langle data\ specs \rangle \} \{ \langle column\ index \rangle \}$

Column index must be expanded.

```
\newcommand*\@dtl@getdatatype[3]{%
  \def\@dtl@get@keydata##1% stuff before
```

```

\db@plist@elt@w% start of key block
\db@col@id@w #3\db@col@id@end@% column index
\db@key@id@w ##2\db@key@id@end@% key id
\db@type@id@w ##3\db@type@id@end@% data type
\db@header@id@w ##4\db@header@id@end@% header
\db@col@id@w #3\db@col@id@end@% column index
\db@plist@elt@end@% end of key block
##5% stuff afterwards
\q@nil{\def#1{##3}}%
\@dtl@get@keydata#2\q@nil
}

```

\@dtl@getprops

```

\@dtl@getprops{\<key cs>}{\<type cs>}{\<header toks>}{\<before toks>}{\<after
toks>}{\<data specs>}{\<column index>}

```

Column index must be expanded.

```

\newcommand*{\@dtl@getprops}[7]{%
\def\@dtl@get@keydata##1% stuff before
\db@plist@elt@w% start of key block
\db@col@id@w #7\db@col@id@end@% column index
\db@key@id@w ##2\db@key@id@end@% key id
\db@type@id@w ##3\db@type@id@end@% data type
\db@header@id@w ##4\db@header@id@end@% header
\db@col@id@w #7\db@col@id@end@% column index
\db@plist@elt@end@% end of key block
##5% stuff afterwards
\q@nil{%
\def#1{##2}% key
\def#2{##3}% data type
#3={##4}% header
#4={##1}% before stuff
#5={##5}% after stuff
}%
\@dtl@get@keydata#6\q@nil
}

```

\@dtl@before

```

\newtoks\@dtl@before

```

\@dtl@after

```

\newtoks\@dtl@after

```

\@dtl@colhead

```

\newtoks\@dtl@colhead

```

\@dtl@updatekeys

```

\@dtl@updatekeys{\<db>}{\<key>}{\<value>}

```


Adds key to database's key list if it doesn't exist. The value is used to update the data type associated with that key. Key must be fully expanded. Doesn't check if database exists.

```
\newcommand*{\@dtl@updatekeys}[3]{%
```

Check if key already exists

```
\@sDTLifhaskey{#1}{#2}%
{%
```

Key exists, may need to update data type. First get the column index.

```
\expandafter\dtlcolumnnum\expandafter
=\dtlcolumnindex{#1}{#2}\relax
```

Get the properties for this column

```
\edef\@dtl@dogetprops{\noexpand\@dtl@getprops
{\noexpand\@dtl@key}{\noexpand\@dtl@type}%
{\noexpand\@dtl@colhead}{\noexpand\@dtl@before}%
{\noexpand\@dtl@after}{\the\csname dtlkeys@#1\endcsname}%
{\number\dtlcolumnnum}}
\@dtl@dogetprops
```

Is the value empty?

```
\ifstrempy{#3}%
{%
```

Leave data type as it is

```
}%
{%
```

Make a copy of current data type

```
\let\@dtl@oldtype\@dtl@type
```

Check the data type for this entry (stored in \@dtl@datatype)

```
\@dtl@checknumerical{#3}%
```

If this column currently has no data type assigned to it then use the new type.

```
\ifdefempty{\@dtl@type}%
{%
\edef\@dtl@type{\number\@dtl@datatype}%
}%
{%
```

This column already has an associated data type but it may need updating.

```
\ifcase\@dtl@datatype % string
```

String overrides all other types

```
\def\@dtl@type{0}%
\or % int
```

All other types override int, so leave it as it is

```
\or % real
```

Real overrides int, but not currency or string

```
\ifnum\@dtl@type=1\relax
\def\@dtl@type{2}%
\fi
\or % currency
```

Currency overrides int and real but not string

```
\ifnum\@dtl@type>0\relax
\def\@dtl@type{3}%
\fi
\fi
}%
```

Has the data type been updated?

```
\ifx\@dtl@oldtype\@dtl@type
```

No change needed

```
\else
```

Update required

```
\toks@gconcat@middle@cx{dtlkeys@#1}%
{\@dtl@before}%
{%
\noexpand\db@plist@elt@w% start of key block
\noexpand\db@col@id@w \the\dtlcolumnnum
\noexpand\db@col@id@end@% column index
\noexpand\db@key@id@w #2\noexpand\db@key@id@end@% key id
\noexpand\db@type@id@w \@dtl@type
\noexpand\db@type@id@end@% data type
\noexpand\db@header@id@w \the\@dtl@colhead
\noexpand\db@header@id@end@% header
\noexpand\db@col@id@w \the\dtlcolumnnum
\noexpand\db@col@id@end@% column index
\noexpand\db@plist@elt@end@% end of key block
}%
{\@dtl@after}%
\fi
}%
}%
{%
```

Key doesn't exist. Increment column count.

```
\expandafter\global\expandafter\advance
\csname dtlcols@#1\endcsname by 1\relax
\dtlcolumnnum=\csname dtlcols@#1\endcsname\relax
```

Set column index for this key

```
\expandafter\xdef\csname dtl@ci@#1@#2\endcsname{%
\number\dtlcolumnnum}%
```

Get data type for this entry (stored in \@dtl@datatype)

```
\ifstrempy{#2}%
```

```
{%
\edef\@dtl@type{% don't know data type yet
}%
{%
\@dtl@checknumerical{#3}%
\edef\@dtl@type{\number\@dtl@datatype}%
}%
```

Append to property list

```
\toks@gput@right@cx{dtlkeys@#1}%
{%
\noexpand\db@plist@elt@w
\noexpand\db@col@id@w \the\dtlcolumnnum
\noexpand\db@col@id@end@
\noexpand\db@key@id@w #2\noexpand\db@key@id@end@
\noexpand\db@type@id@w \@dtl@type
\noexpand\db@type@id@end@
\noexpand\db@header@id@w #2\noexpand\db@header@id@end@
\noexpand\db@col@id@w \the\dtlcolumnnum
\noexpand\db@col@id@end@
\noexpand\db@plist@elt@end@
}%
}%
}
```

`\DTLsetheader` `\DTLsetheader{<db>}{<key>}{<header>}`

Sets header for column given by `<key>` in database `<db>`. Starred version doesn't check for existence of database or key.

```
\newcommand*\@DTLsetheader{\@ifstar\@sDTLsetheader\@DTLsetheader}
```

`\@DTLsetheader` Unstarred version

```
\newcommand*\@DTLsetheader}[3]{%
```

Check if database exists

```
\DTLifdbexists{#1}%
{%
```

Check if key exists.

```
\@sDTLifhaskey{#1}{#2}%
{%
\@sDTLsetheader{#1}{#2}{#3}%
}%
{%
\PackageError{datatool}{Database '#1' doesn't contain key
'#2'}{ }%
}%
}%
{%
```

```

\PackageError{datatool}{Database ‘#1’ doesn’t exist}{}%
}%
}

```

\@sDTLsetheader Starred version

```

\newcommand*{\@sDTLsetheader}[3]{%
\expandafter\dtlcolumnnum\expandafter
=\dtlcolumnindex{#1}{#2}\relax
\@dtl@setheaderforindex{#1}{\dtlcolumnnum}{#3}%
}

```

dtl@setheaderforindex

```

\@dtl@setheaderforindex{<db>}{<column index>}{<header>}

```

Sets the header for column given by *<column index>* in database *<db>*. The header must be expanded.

```

\newcommand*{\@dtl@setheaderforindex}[3]{%

```

Get the properties for this column

```

\edef\@dtl@dogetprops{\noexpand\@dtl@getprops
{\noexpand\@dtl@key}{\noexpand\@dtl@type}%
{\noexpand\@dtl@colhead}{\noexpand\@dtl@before}%
{\noexpand\@dtl@after}{\the\csname dtlkeys@#1\endcsname}%
{\number#2}}
\@dtl@dogetprops

```

Store the header in \@dtl@toks

```

\@dtl@colhead={#3}%

```

Reconstruct property list

```

\edef\@dtl@colnum{\number#2}\relax
\toks@gconcat@middle@cx{dtlkeys@#1}%
{\@dtl@before}%
{%
\noexpand\db@plist@elt@w% start of block
\noexpand\db@col@id@w \@dtl@colnum
\noexpand\db@col@id@end@% index
\noexpand\db@key@id@w \@dtl@key\noexpand\db@key@id@end@% key
\noexpand\db@type@id@w \@dtl@type
\noexpand\db@type@id@end@% data type
\noexpand\db@header@id@w \the\@dtl@colhead
\noexpand\db@header@id@end@% header
\noexpand\db@col@id@w \@dtl@colnum
\noexpand\db@col@id@end@% index
\noexpand\db@plist@elt@end@% end of block
}%
{\@dtl@after}%
}

```

`\dtlexpandnewvalue` Expand new value before adding to database

```

\newcommand*{\dtlexpandnewvalue}{%
  \def\@dtl@setnewvalue##1{\protected@edef\@dtl@tmp{##1}%
  \expandafter\@dtl@toks\expandafter{\@dtl@tmp}}%
}

```

`dtlnoexpandnewvalue` Don't expand new value before adding to database

```

\newcommand*{\dtlnoexpandnewvalue}{%
  \def\@dtl@setnewvalue##1{\@dtl@toks{##1}}%
}

```

Do this by default:

```

\dtlnoexpandnewvalue

```

`\DTLnewdbentry` `\DTLnewdbentry{<db name>}{<id>}{<value>}`.

Adds an entry to the last row (adds new row if database is empty) and updates general column information if necessary. The starred version doesn't check if the database exists.

```

\newcommand{\DTLnewdbentry}{%
  \@ifstar\@sDTLnewdbentry\@DTLnewdbentry
}

```

`\@DTLnewdbentry` Unstarred version of `\DTLnewdbentry`.

```

\newcommand{\@DTLnewdbentry}[3]{%
  \DTLifdbexists{#1}%
  {\@sDTLnewdbentry{#1}{#2}{#3}}%
  {\PackageError{datatool}{Can't add new entry to database '#1':
    database doesn't exist}{}%
}

```

`\@sDTLnewdbentry` Starred version of `\DTLnewdbentry` (doesn't check if the database exists).

```

\newcommand*{\@sDTLnewdbentry}[3]{%

```

Update key list

```

\@dtl@updatekeys{#1}{#2}{#3}%

```

Get the column index

```

\expandafter\dtlcolumnnum\expandafter
=\dtlcolumnindex{#1}{#2}\relax

```

Get the current row:

```

\edef\dtl@dogetrow{\noexpand\dtlgetrow{#1}%
  {\number\csize dtlrows@#1\endcsize}}%
\dtl@dogetrow

```

Check if this row already has an entry for the given column.

```

\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow
  {\noexpand\dtl@entry}{\number\dtlcolumnnum}%

```

```

}%
\dtl@dogetentry
\ifx\dtl@entry\dtlnovalue
Store the value of this entry in \@dtl@toks
\@dtl@setnewvalue{#3}%
There are no entries in this row for the given column. Add this entry.
\toks@gconcat@middle@cx{dtldb@#1}%
{\dtlbeforerow}%
{%
Start of this row:
\noexpand\db@row@elt@w%
Row ID:
\noexpand\db@row@id@w \number\csname dtlrows@#1\endcsname
\noexpand\db@row@id@end@%
Current row so far
\the\dtlcurrentrow
New column: Column ID
\noexpand\db@col@id@w \number\dtlcolumnnum
\noexpand\db@col@id@end@%
Value:
\noexpand\db@col@elt@w \the\@dtl@toks
\noexpand\db@col@elt@end@%
Column ID:
\noexpand\db@col@id@w \number\dtlcolumnnum
\noexpand\db@col@id@end@%
Row ID:
\noexpand\db@row@id@w \number\csname dtlrows@#1\endcsname
\noexpand\db@row@id@end@%
End of this row
\noexpand\db@row@elt@end@%
}%
Rest (this should be empty)
{\dtlafterrow}%
Print information message if in verbose mode.
\dtl@message{Added #2\space -> #3\space to database '#1'}%
\else
There's already an entry for the given column in this row
\PackageError{datatool}{Can't add entry with ID '#2' to
current row of database '#1'}{There is already an entry with
this ID in the current row}%
\fi
}

```

`\DTLifdbexists` `\DTLifdbexists{<db name>}{<true part>}{<false part>}`

Checks if a data base with the given name exists.

```
\newcommand{\DTLifdbexists}[3]{%
  \@ifundefined{dtldb@#1}{#3}{#2}}
```

4.4 Accessing Data

`\DTLassign` `\DTLassign{<db>}{<row idx>}{<assign list>}`

Assigns values given in *<assign list>* for row *<row idx>* in database *<db>*. (Where *<assign list>* is in the same form as in `\DTLforeach`)

```
\newcommand*\DTLassign}[3]{%
```

Grouped in the event that `\dtlcurrentrow` is already in use. (Assignments in `\@dtl@assign` are global.)

```
{%
  \dtlgetrow{#1}{#2}%
  \@dtl@assign{#3}{#1}%
}%
}
```

`\@dtl@assign` `\@dtl@assign{<list>}{<db>}`

Assigns commands according to the given keys. The current row must be stored in `\dtlcurrentrow`.

```
\newcommand*\@dtl@assign}[2]{%
  \@dtl@assigncmd#1,\@nil\@{#2}%
}
```

`\@dtl@assigncmd` `\@dtl@assigncmd<cmd>=<id>\@nil`

```
\def\@dtl@assigncmd#1#2=#3,#4\@{#5}{%
```

get entry for ID given by #3 and store in #2

```
\@sDTLifhaskey{#5}{#3}%
{%
  \edef\@dtl@dogetentry{%
    \noexpand\dtlgetentryfromcurrentrow
      {\noexpand#1}{\dtlcolumnindex{#5}{#3}}}%
  \@dtl@dogetentry
```

Set to null if required

```
\ifx#1\dtlnovalue
  \@dtl@setnull{#1}{#3}%
\fi
```

Make it global

```
\global\let#1=#1\relax
}%
{%
\PackageError{datatool}{Can't assign \string#1\space: there
is no key '#3' in data base '#5'}{}%
```

Set to null

```
\global\let#1\DTLstringnull
}%
```

Recurse?

```
\def\dtl@tmp{#4}%
\ifx\@nnil\dtl@tmp
  \let\@dtl@next\@dtl@assigncmdnoop
\else
  \let\@dtl@next\@dtl@assigncmd
\fi
\@dtl@next#4\@{#5}%
}
```

\@dtl@assigncmdnoop End loop

```
\def\@dtl@assigncmdnoop#1\@{#2{}
```

```
\@dtl@setnull \@dtl@setnull{<cmd>}{<id>} sets <cmd> to either \DTLstringnull or \DTLnumbernull
depending on the data type for <id>. (Database name should be stored in
\@dtl@dbname prior to use.)
```

```
\newcommand*{\@dtl@setnull}[2]{%
```

Check if database given by \@dtl@dbname has the required key.

```
\@sDTLifhaskey{\@dtl@dbname}{#2}%
{%
```

Set to null

```
\@dtl@setnull{#1}{#2}%
}%
{%
```

Key not defined in database \@dtl@dbname.

```
\global\let#1=\DTLstringnull
}%
}
```

\@dtl@setnull As above, but doesn't check if key exists

```
\newcommand*{\@dtl@setnull}[2]{%
```


Get the data type associated with this key and store in \@dtl@type.

```
\@sdtlgetdatatype{\@dtl@type}{\@dtl@dbname}{#2}%
```

Check data type.

```
\ifnum0\@dtl@type=0\relax
```

Data type is *empty* or 0, so set to string null.

```
\global\let#1=DTLstringnull
\else
```

Data type is numerical, so set to number null.

```
\global\let#1=DTLnumbernull
\fi
}
```

\DTLstringnull String null value:

```
\newcommand*{\DTLstringnull}{NULL}
```

\DTLnumbernull Number null value:

```
\newcommand*{\DTLnumbernull}{0}
```

\DTLifnull \DTLifnull{<value>}{<true part>}{<false part>}

Checks if *<value>* is null (either \DTLstringnull or \DTLnumbernull) if true, does *<true part>* otherwise does *<false part>*.

```
\newcommand*{\DTLifnull}[3]{%
\ifx\DTLstringnull#1\relax
#2%
\else
\ifx\DTLnumbernull#1\relax
#2%
\else
#3%
\fi
\fi
}
```

\@dtlnovalue

```
\def\@dtlnovalue{Undefined Value}
```

\dtlnovalue

```
\def\dtlnovalue{\@dtlnovalue}
```

\DTLgetkeydata \DTLgetkeydata{<key>}{<db>}{<col cs>}{<type cs>}{<header cs>}

Gets data for given key in database $\langle db \rangle$: the column index is stored in $\langle col cs \rangle$ and data type is stored in $\langle type cs \rangle$. The unstarred version checks for the existence of the database and key, the starred version doesn't.

```
\newcommand*\DTLgetkeydata{%
  \ifstar\sdtlgetkeydata\dtlgetkeydata
}
```

$\backslash\text{dtlgetkeydata}$ Unstarred version of $\backslash\text{DTLgetkeydata}$

```
\newcommand*\@dtlgetkeydata[5]{%
```

Check if the database exists.

```
\DTLifdbexists{#2}%
{%
```

Check if the given key exists in the database.

```
\@sDTLifhaskey{#2}{#1}%
{%
```

Get the data.

```
\@sdtlgetkeydata{#1}{#2}{#3}{#4}{#5}%
}%
{%
```

Key not defined in the given database.

```
\PackageError{datatool}{Key ‘#1’ not defined in database
‘#2’}{}%
}%
}%
{%
```

Database not defined.

```
\PackageError{datatool}{Database ‘#2’ doesn’t exist}{}%
}%
}
```

$\backslash\text{sdtlgetkeydata}$ $\backslash\text{sdtlgetkeydata}\{\langle key \rangle\}\{\langle db \rangle\}\{\langle col cs \rangle\}\{\langle type cs \rangle\}\{\langle header cs \rangle\}$ Starred version of $\backslash\text{DTLgetkeydata}$.

```
\newcommand*\@sdtlgetkeydata[5]{%
  \@sdtl@getcolumnindex{#3}{#2}{#1}%
  \edef\@dtl@dogetkeydata{\noexpand\@dtl@getprops
    {\noexpand\@dtl@key}{\noexpand#4}{\noexpand\@dtl@colhead}%
    {\noexpand\@dtl@before}{\noexpand\@dtl@after}%
    {\expandafter\the\csname dtlkeys@#2\endcsname}%
    {#3}}%
  \@dtl@dogetkeydata
  \edef#5{\the\@dtl@toks}%
}
```

$\backslash\text{dtl@gathervalues}$ $\backslash\text{dtl@gathervalues}[\langle label \rangle]\{\langle db name \rangle\}\{\langle row toks \rangle\}$

Stores each element of $\langle row \rangle$ in $\langle db\ name \rangle$ into the command $\backslash@dtl@{\langle label \rangle}@{\langle key \rangle}$, where $\langle key \rangle$ is the key for that element, and $\langle label \rangle$ defaults to key.

```
\newcommand{\dtl@gathervalue}[3][key]{%
  \dtlforeachkey(\@dtl@key,\@dtl@col,\@dtl@type,\@dtl@head)\in{#2}\do
  {%
    \dtlgetentryfromrow{\@dtl@tmp}{\@dtl@col}{\dtlcurrentrow}%
    \ifx\@dtl@tmp\dtlnovalue
      \@dtl@setnull{\@dtl@tmp}{\@dtl@key}%
    \fi
    \expandafter\let\csname @dtl@#1@\@dtl@key\endcsname\@dtl@tmp
  }%
}
```

$\backslash dtlcurrentrow$ Define token register to store current row.

```
\newtoks\dtlcurrentrow
```

$\backslash dtlbeforerow$ Define token register to store everything before the current row.

```
\newtoks\dtlbeforerow
```

$\backslash dtlafterrow$ Define token register to store everything after the current row.

```
\newtoks\dtlafterrow
```

$\backslash dtlgetrow$ $\backslash dtlgetrow{\langle db \rangle}{\langle row\ idx \rangle}$

Gets row with index $\langle row\ idx \rangle$ from database named $\langle db \rangle$ and stores the row in $\backslash dtlcurrentrow$, the preceding rows in $\backslash dtlbeforerow$ and the following rows in $\backslash dtlafterrow$. The row index, $\langle row\ idx \rangle$, is stored in $\backslash dtlrownum$ and the database name, $\langle db \rangle$, is stored in $\backslash dtldbname$. This assumes that the given row exists.

```
\newcommand*\dtlgetrow[2]{%
  \dtlrownum=#2\relax
  \edef\dtldbname{#1}%
  \expandafter\toks@\expandafter=\csname dtldb@#1\endcsname
  \edef\@dtl@dogetrow{\noexpand\@dtlgetrow{\the\toks@}{\number#2}}%
  \@dtl@dogetrow
}
```

$\backslash @dtlgetrow$ $\backslash @dtlgetrow{\langle data\ specs \rangle}{\langle row\ idx \rangle}$

Gets the row specs from $\langle data\ specs \rangle$ for row with index $\langle row\ idx \rangle$ which must be fully expanded.

```
\newcommand*\@dtlgetrow[2]{%
  \def\@dtl@getrow##1% before stuff
    \db@row@elt@w% start of the row
    \db@row@id@w #2\db@row@id@end@% row id
```

```

        ##2%
        \db@row@id@w #2\db@row@id@end@% row id
        \db@row@elt@end@% end of the row
        ##3% after stuff
        \q@nil{\dtlbeforerow={##1}\dtlcurrentrow={##2}\dtlafterrow={##3}}%
        \@dtl@getrow#1\q@nil
    }

```

\dtlrecombine \dtlrecombine

Recombines database contents from \dtlbeforerow, \dtlcurrentrow and \dtlafterrow

```

    \newcommand*{\dtlrecombine}{%
        \toks@gconcat@middle@cx{dtldb@\dtldbname}%
        {\dtlbeforerow}%
        {%

```

Start of row tag

```

        \noexpand\db@row@elt@w

```

Row number

```

        \noexpand\db@row@id@w
        \number\dtlrownum
        \noexpand\db@row@id@end@

```

Current row specs:

```

        \the\dtlcurrentrow

```

Row number

```

        \noexpand\db@row@id@w
        \number\dtlrownum
        \noexpand\db@row@id@end@

```

End of row tag

```

        \noexpand\db@row@elt@end@
    }%
    {\dtlafterrow}%
}

```

recombineomitcurrent \dtlrecombineomitcurrent

Like \dtlrecombine but omits \dtlcurrentrow

```

    \newcommand{\dtlrecombineomitcurrent}{%

```

Decrement row indices in \dtlafterrow:

```

        \dtl@decrementrows{\dtlafterrow}{\dtlrownum}

```

Reconstruct database contents by concatenating \dtlbeforerow and \dtlafterrow

```
\csname dtldb@\dtldbname\endcsname=\dtlbeforerow
\toks@gput@right@cx{\dtldb@\dtldbname}{\the\dtlafterrow}%
\dtl@message{Removed row \number\dtlrownum\space in database
'\dtldbname'}%
}
```

\dtlsplitrow `\dtlsplitrow{<row specs>}{<col num>}{<before cs>}{<after cs>}`

Splits the row around the entry given by <col num>. The entries before the split are stored in <before cs> and the entries after the split are stored in <after cs>. <row specs> and <col num> need to be expanded before use.

```
\newcommand*{\dtlsplitrow}[4]{%
\def\@dtlsplitrow##1%before stuff
\db@col@id@w #2\db@col@id@end@% column id
##2% unwanted stuff
\db@col@id@w #2\db@col@id@end@% column id
##3% after stuff
\q@nil{\def#3{##1}\def#4{##3}}%
\@dtlsplitrow#1\q@nil
}
```

\dtlreplaceentryincurrentrow `\dtlreplaceentryincurrentrow{<new value>}{<col num>}`

Replaces entry for column <col num> in \dtlcurrentrow with <new value>

```
\newcommand*{\dtlreplaceentryincurrentrow}[2]{%
```

Split row

```
\edef\@dtl@do@splitrow{\noexpand\dtlsplitrow
{\the\dtlcurrentrow}%
{\number#2}%
{\noexpand\@dtl@before@cs}%
{\noexpand\@dtl@after@cs}}%
\@dtl@do@splitrow
```

Recombine with new value

```
\toks@{#1}%
\edef\@dtl@stuff{%
\expandonce\@dtl@before@cs
```

Begin column index specs:

```
\noexpand\db@col@id@w \number#2\noexpand
\noexpand\db@col@id@end@% column id
```

New entry:

```
\noexpand\db@col@elt@w
\the\toks@
\noexpand\db@col@elt@end@
```

End column index specs:

```
\noexpand\db@col@id@w \number#2\noexpand
\noexpand\db@col@id@end@% column id
\expandonce\@dtl@after@cs
}%
```

Store in \dtlcurrentrow

```
\expandafter\dtlcurrentrow\expandafter{\@dtl@stuff}%
```

Update column specs

```
\@sdtlgetkeyforcolumn{\@dtl@key}{\dtldbname}{#2}%
\@dtl@updatekeys{\dtldbname}{\@dtl@key}{#1}%
\dtl@message{Updated \@dtl@key\space -> #1\space in database
'\dtldbname'}}%
}
```

oveentryincurrentrow

```
\dtlremoveentryincurrentrow{<col idx>}
```

Removes entry for column <col idx> from \dtlcurrentrow.

```
\newcommand*{\dtlremoveentryincurrentrow}[1]{%
```

Split row

```
\edef\@dtl@do@splitrow{\noexpand\dtlsplitrow
{\the\dtlcurrentrow}%
{\number#1}%
{\noexpand\@dtl@before@cs}%
{\noexpand\@dtl@after@cs}}%
\@dtl@do@splitrow
```

Combine row without given column:

```
\edef\@dtl@stuff{%
\expandonce\@dtl@before@cs
\expandonce\@dtl@after@cs
}%
```

Store in \dtlcurrentrow

```
\expandafter\dtlcurrentrow\expandafter{\@dtl@stuff}%
\dtl@message{Removed entry from column \number#1\space\space in database
'\dtldbname'}}%
}
```

pentriesincurrentrow

```
\dtlswapentriesincurrentrow{<col1 num>}{<col2 num>}
```

Swaps columns <col1 num> and <col2 num> in \dtlcurrentrow

```
\newcommand*{\dtlswapentriesincurrentrow}[2]{%
\dtlgetentryfromcurrentrow{\@dtl@entryI}{#1}%
\dtlgetentryfromcurrentrow{\@dtl@entryII}{#2}%
\expandafter\dtlreplaceentryincurrentrow\expandafter
```

```

        {\@dtl@entryII}{#1}%
\expandafter\dtlreplaceentryincurrentrow\expandafter
        {\@dtl@entryI}{#2}%
}

```

entryfromcurrentrow `\dtlgetentryfromcurrentrow{<cs>}{<col num>}`

Gets value for column *<col num>* from `\dtlcurrentrow` and stores in *<cs>*. If not found, *<cs>* is set to `\dtlnovalue`.

```

\newcommand*{\dtlgetentryfromcurrentrow}[2]{%
\dtlgetentryfromrow{#1}{#2}{\dtlcurrentrow}%
}

```

\dtlgetentryfromrow `\dtlgetentryfromrow{<cs>}{<col num>}{<row toks>}`

```

\newcommand*{\dtlgetentryfromrow}[3]{%
\edef\@dtl@do@getentry{\noexpand\dtl@getentryfromrow
\@dtl@do@getentry
}

```

\dtl@getentryfromrow `\dtl@getentryfromrow{<cs>}{<col num>}{<row specs>}`

```

\newcommand*{\dtl@getentryfromrow}[3]{%
\def\dtl@dogetentry##1% before stuff
\db@col@id@w #2\db@col@id@end@% Column id
\db@col@elt@w ##2\db@col@elt@end@% Value
\db@col@id@w #2\db@col@id@end@% Column id
##3% Remaining stuff
\q@nil{\def#1{##2}}%
\dtl@dogetentry#3%
\db@col@id@w #2\db@col@id@end@%
\db@col@elt@w \@dtlnovalue\db@col@elt@end@%
\db@col@id@w #2\db@col@id@end@%
\q@nil
}

```

endentrytocurrentrow `\dtlappendentrytocurrentrow{<key>}{<value>}`

Appends entry to `\dtlcurrentrow`

```

\newcommand*{\dtlappendentrytocurrentrow}[2]{%

```

Update information about this column (adding new column if necessary)

```

\@dtl@updatekeys{\dtldbname}{#1}{#2}%

```

Get column index and store in \dtlcolumnnum

```
\expandafter\dtlcolumnnum\expandafter  
=\dtlcolumnindex{\dtldbname}{#1}\relax
```

Does this row already have an entry with this key?

```
\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow  
{\noexpand\dtl@entry}{\number\dtlcolumnnum}%  
}%  
\dtl@dogetentry  
\ifx\dtl@entry\dtlnovalue
```

There are no entries in this row for the given key. Expand entry value before storing.

```
\protected@edef\@dtl@tmp{#2}%  
\expandafter\@dtl@toks\expandafter{\@dtl@tmp}%
```

Append this entry to the current row.

```
\toks@gput@right@cx{\dtlcurrentrow}%  
{%
```

Begin column index specs:

```
\noexpand\db@col@id@w  
\number\dtlcolumnnum  
\noexpand\db@col@id@end@
```

New entry:

```
\noexpand\db@col@elt@w  
\the\@dtl@toks  
\noexpand\db@col@elt@end@
```

End column index specs:

```
\noexpand\db@col@id@w  
\number\dtlcolumnnum  
\noexpand\db@col@id@end@  
}%
```

Print information to terminal and log file if in verbose mode.

```
\dtl@message{Appended #1\space -> #2\space to database  
'\dtldbname'}%  
\else
```

There is already an entry in this row for the given key

```
\PackageError{datatool}{Can't append entry to row:  
there is already an entry for key '#1' in this row}{}%  
\fi  
}
```

\DTLgetvalue \DTLgetvalue{\<cs>}{\<db>}{\<r>}{\<c>}

Gets the element in row $\langle r \rangle$, column $\langle c \rangle$ from database $\langle db \rangle$ and stores in $\langle cs \rangle$.


```

\newcommand*{\DTLgetvalue}[4]{%
  \edef\dtl@dogetvalue{\noexpand\dtl@getvalue{\noexpand#1}{#2}%
    {\number#3}{\number#4}}%
  \dtl@dogetvalue
}

```

\dtl@getvalue

```

\newcommand*{\dtl@getvalue}[4]{%
  \def\@dtl@getvalue##1% stuff before row <r>
    \db@row@id@w #3\db@row@id@end@% row <r> id
    ##2% stuff in row <r> before column <c>
    \db@col@id@w #4\db@col@id@end@% column <c> id
    \db@col@elt@w ##3\db@col@elt@end@% value
    ##4% stuff after value
    \q@nil{\def#1{##3}}%
  \toks@=\csname dtldb@#2\endcsname
  \expandafter\@dtl@getvalue\the\toks@% contents of data base
    \db@row@id@w #3\db@row@id@end@%
    \db@col@id@w #4\db@col@id@end@%
    \db@col@elt@w \@dtlnovalue\db@col@elt@end@% undefined value
    \q@nil
  \ifx#1\dtlnovalue
    \PackageError{datatool}{There is no element at (row=#3,
      column=#4) in database ‘#2’}{}%
  \fi
}

```

\DTLgetlocation

\DTLgetlocation{<row cs>}{<column cs>}{<database>} {<value>}

Assigns <row cs> and <column cs> to the indices of the first entry in <database> that matches <value>.

```

\newcommand*{\DTLgetlocation}[4]{%
  \def\@dtl@getlocation##1% stuff before value
    \db@col@elt@w #4\db@col@elt@end@% value
    \db@col@id@w ##2\db@col@id@end@% column id
    ##3% stuff after this column
    \db@row@id@w ##4\db@row@id@end@% row id
    ##5% stuff after row
    \q@nil{\def#1{##4}\def#2{##2}}%
  \toks@=\csname dtldb@#3\endcsname
  \expandafter\@dtl@getlocation\the\toks@% contents of data base
    \db@col@elt@w #4\db@col@elt@end@% value
    \db@col@id@w \@dtlnovalue\db@col@id@end@% undefined column id
    \db@row@id@w \@dtlnovalue\db@row@id@end@% undefined row id
    \q@nil
  \ifx#1\dtlnovalue
    \PackageError{datatool}{There is no element ‘#4’ in
      database ‘#3’}{}%
  \fi
}

```

```

\fi
}

```

4.5 Iterating Through Databases

```

\@dtlforeachrow \@dtlforeachrow(<idx cs>,<row cs>)\in{<db>} \do{<body>}

```

Iterates through each row in database. Assigns the current row index to *<idx cs>* and the row specs to *<row cs>*

```

\long\def\@dtlforeachrow(#1,#2)\in#3\do#4{%
  \edef\dtl@tmp{\expandafter\the\csname dtldb@#3\endcsname}%
  \expandafter\@dtlforeachrow\dtl@tmp
  \db@row@elt@w%
  \db@row@id@w \@nil\db@row@id@end@%
  \db@row@id@w \@nil\db@row@id@end@%
  \db@row@elt@end@%
  \@{#1}{#2}{#4}\q@nil
}

```

```

\@dtl@foreachrow

```

```

\long\def\@dtl@foreachrow\db@row@elt@w%
\db@row@id@w #1\db@row@id@end@%
#2\db@row@id@w #3\db@row@id@end@%
\db@row@elt@end@#4\@#5#6#7\q@nil{%

```

Define control sequence given by #5

```

\gdef#5{#1}%

```

Hide the loop body in a macro

```

\gdef\@dtl@loopbody{#7}%

```

Increment level counter to allow for nested loops

```

\global\advance\@dtl@foreach@level by 1\relax

```

Check if we have reached the end of the loop

```

\ifx#5\@nnil
  \expandafter\global\expandafter
    \let\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
      =\@dtl@foreachnoop
\else
  \gdef#6{#2}%

```

Set up the break function: Make a copy of current break function

```

\expandafter\let
  \csname @dtl@break@the\@dtl@foreach@level\endcsname
  \dtlbreak

```

Setup break function for this level

```
\gdef\dtlbreak{\expandafter\global\expandafter
\let\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
=\@dtl@foreachnoop}%
```

Initialise

```
\expandafter\global\expandafter
\let\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
=\@dtl@foreachrow
```

Do body of loop

```
\@dtl@loopbody
```

Restore break function

```
\expandafter\let\expandafter\dtlbreak
\csname @dtl@break@\the\@dtl@foreach@level\endcsname
\fi
```

Set up what to do next.

```
\expandafter\let\expandafter\@dtl@foreachnext
\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
```

Decrement level counter.

```
\global\advance\@dtl@foreach@level by -1\relax
```

Repeat loop if necessary.

```
\@dtl@foreachnext#4\@@{#5}{#6}{#7}\q@nil
}
```

\@dtl@foreachnoop

```
\long\def\@dtl@foreachnoop#1\@@#2\q@nil{}
```

\dtlforeachkey

```
\dtlforeachkey(<key cs>,<col cs>,<type cs>,<header cs>)
\in{<db>}\do{<body>}
```

Iterates through all the keys in database <db>. In each iteration, <key cs> stores the key, <col cs> stores the column index and <type cs> stores the data type.

```
\long\def\dtlforeachkey(#1,#2,#3,#4)\in#5\do#6{%
\gdef\@dtl@loopbody{#6}%
\edef\@dtl@keys{\expandafter\the\csname dtlkeys@#5\endcsname}%
\expandafter\@dtl@foreachkey\@dtl@keys
\db@plist@elt@w%
\db@col@id@w -1\db@col@id@end@%
\db@key@id@w \db@key@id@end@%
\db@type@id@w \db@type@id@end@%
\db@header@id@w \db@header@id@end@%
\db@col@id@w -1\db@col@id@end@%
\db@plist@elt@end@%
\@@{\@dtl@updatefkcs{#1}{#2}{#3}{#4}}\q@nil
}
```

`\@dtl@updatefkcs`

```
\newcommand*{\@dtl@updatefkcs}[8]{%
  \gdef#1{#5}%
  \gdef#2{#6}%
  \gdef#3{#7}%
  \gdef#4{#8}%
}
```

`\@dtl@foreachkey` Sets everything globally in case it occurs in a tabular environment Loop body needs to be stored in `\@dtl@loopbody`. #7 indicates an update macro.

```
\long\def\@dtl@foreachkey\db@plist@elt@w%
\db@col@id@w #1\db@col@id@end@%
\db@key@id@w #2\db@key@id@end@%
\db@type@id@w #3\db@type@id@end@%
\db@header@id@w #4\db@header@id@end@%
\db@col@id@w #5\db@col@id@end@%
\db@plist@elt@end@#6\@#7\q@nil{%
  \ifnum#1=-1\relax
```

Terminate loop

```
\let\@dtl@foreachnext\@dtl@foreachnoop
\else
```

Set up loop variables

```
#7{#2}-{#1}-{#3}-{#4}%
```

Increment level counter to allow for nested loops

```
\global\advance\@dtl@foreach@level by 1\relax
```

Set up the break function

```
\expandafter\let
\csname @dtl@break@\the\@dtl@foreach@level\endcsname
\dtlbreak
\gdef\dtlbreak{\expandafter\global\expandafter
\let\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
=\@dtl@foreachnoop}%
```

Initialise

```
\expandafter\global\expandafter
\let\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
=\@dtl@foreachkey
```

Do body of loop

```
\@dtl@loopbody
```

Set up what to do next

```
\expandafter\let\expandafter\@dtl@foreachnext
\csname @dtl@foreachnext\the\@dtl@foreach@level\endcsname
```

Restore break function

```
\expandafter\let\expandafter\dtlbreak
\csname @dtl@break@\the\@dtl@foreach@level\endcsname
```

Decrement level counter

```
\global\advance\@dtl@foreach@level by -1\relax
\fi
```

Recurse if necessary

```
\@dtl@foreachnext#6\@@{#7}\q@nil
}
```

```
\dtlforcolumn \dtlforcolumn{<cs>}{<db>}{<key>}{<body>}
```

Iterates through column given by *<key>* in database *<db>*. *<cs>* is assign to the element of the column in the current iteration. Starred version doesn't check if data base exists

```
\newcommand*{\dtlforcolumn}{\@ifstar\@sdtlforcolumn\@dtlforcolumn}
```

```
\@dtlforcolumn
```

```
\newcommand{\@dtlforcolumn}[4]{%
```

Check if data base exists

```
\DTLifdbexists{#2}%
{%
  \DTLifhaskey{#2}{#3}%
  {%
    \@sdtlforcolumn{#1}{#2}{#3}{#4}%
  }%
}
```

key not in data base

```
{%
  \PackageError{datatool}{Database ‘#2’ doesn’t contain
    key ‘#3’}{}%
}%
}%
%
{%
  \PackageError{datatool}{Database ‘#2’ doesn’t exist}{}%
}%
}
```

```
\@sdtlforcolumn
```

```
\newcommand{\@sdtlforcolumn}[4]{%
  \toks@{#4}%
  \edef\@dtl@doformcol{\noexpand\dtlforcolumn{\noexpand#1}%
    {\expandafter\the\csname dtldb@#2\endcsname}%
    {\dtlcolumnindex{#2}{#3}}{\the\toks@}%
  }%
  \@dtl@doformcol%
}
% end{macrocode}
```

```

%\end{macro}
%
%\begin{macro}{\dtlforcolumnidx}
%\begin{definition}
%\cs{dtlforcolumnidx}\marg{cs}\marg{db}\marg{col num}\marg{body}
%\end{definition}
% Iterates through the column with index <col num> in database <db>.
% Starred version doesn't check if database exists.
%\changes{2.0}{2009 February 27}{new}
% \begin{macrocode}
\newcommand*{\dtlforcolumnidx}{%
  \ifstar\@sdtlforcolumnidx\@dtlforcolumnidx
}
% \end{macrocode}
%\end{macro}
%
%\begin{macro}{\@dtlforcolumnidx}
% \begin{macrocode}
\newcommand{\@dtlforcolumnidx}[4]{%
  \DTLifdbexists{#2}%
  {%
    \expandafter\ifnum\csname dtlcols@#2\endcsname<#3\relax
    \PackageError{datatool}{Column index \number#3\space out of
      bounds for database '#2'}{Database '#2' only has
      \expandafter\number\csname dtlcols@#2\endcsname\space
      columns}%
    \else
    \ifnum#3<1\relax
    \PackageError{datatool}{Column index \number#3\space out of
      bounds for database '#2'}{Indices start from 1}%
    \else
    \@sdtlforcolumnidx{#1}{#2}{#3}{#4}%
    \fi
    \fi
  }%
}
data base doesn't exist
{%
  \PackageError{datatool}{Database '#2' doesn't exist}{}%
}%
}

```

\@sdtlforcolumnidx

```

\newcommand{\@sdtlforcolumnidx}[4]{%
  \toks@{#4}%
  \edef\@dtl@doformcol{\noexpand\dtl@formcolumn{\noexpand#1}%
    {\expandafter\the\csname dtldb@#2\endcsname}%
    {\number#3}{\the\toks@}}%
  }%
  \@dtl@doformcol

```

```

}
% \end{macrocode}
%\end{macro}
%
%\begin{macro}{\dtl@forcolumn}
%\begin{definition}
%\cs{dtl@forcolumn}\marg{cs}\marg{db specs}\marg{col num}\marg{body}
%\end{definition}
% \meta{col num} needs to be fully expanded
% \begin{macrocode}
\newcommand{\dtl@forcolumn}[4]{%

```

make a copy of break function

```
\let\@dtl@oldbreak\dtlbreak
```

set up break function

```
\def\dtlbreak{\let\@dtl@forcolnext=\@dtl@forcolnoop}%
```

define loop macro for this column

```

\def\@dtl@forcolumn##1% before stuff
  \db@col@id@w #3\db@col@id@end@% column index
  \db@col@elt@w ##2\db@col@elt@end@% entry
  \db@col@id@w #3\db@col@id@end@% column index
  ##3% after stuff
  \q@nil{%
    \def#1{##2}% assign value to <cs>

```

check if end of loop

```

\ifx#1\@nnil
  \let\@dtl@forcolnext=\@dtl@forcolnoop
\else

```

do body of loop

```

  #4%
  \let\@dtl@forcolnext=\@dtl@forcolumn
\fi

```

repeat if necessary

```

  \@dtl@forcolnext##3\q@nil
}%

```

do loop

```

\@dtl@forcolumn#2%
  \db@col@id@w #3\db@col@id@end@%
  \db@col@elt@w \@nil\db@col@elt@end@%
  \db@col@id@w #3\db@col@id@end@\q@nil

```

restore break function

```

  \let\dtlbreak\@dtl@oldbreak
}

```

\@dtl@forcolnoop

```
\def\@dtl@forcolnoop#1\q@nil{}
```

`\dtlforeachlevel` \DTLforeach can only be nested up to three levels. \dtlforeachlevel keeps track of the current level.

```
\newcount\dtlforeachlevel
```

The counter `DTLrow<n>` keeps track of each row of data during the `<n>` nested `\DTLforeach`. It is only incremented in the conditions (given by the optional argument) are met.

```
\newcounter{DTLrowi}
\newcounter{DTLrowii}
\newcounter{DTLrowiii}
```

Keep hyperref happy

```
\newcounter{DTLrow}
\def\theHDTLrow{\arabic{DTLrow}}
\def\theHDTLrowi{\theHDTLrow.\arabic{DTLrowi}}
\def\theHDTLrowii{\theHDTLrowi.\arabic{DTLrowii}}
\def\theHDTLrowiii{\theHDTLrowii.\arabic{DTLrowiii}}

\newcount\dtl@rowi
\newcount\dtl@rowii
\newcount\dtl@rowiii

\newtoks\@dtl@curo
\newtoks\@dtl@previ
\newtoks\@dtl@nexti
\newtoks\@dtl@curoi
\newtoks\@dtl@previi
\newtoks\@dtl@nextii
\newtoks\@dtl@curoii
\newtoks\@dtl@previii
\newtoks\@dtl@nextiii
```

`\DTLsaverowcount` `\DTLsavelastrowcount{<cmd>}`

Stores the maximum row count for the last `\DTLforeach`.

```
\newcommand*{\DTLsavelastrowcount}[1]{%
\ifnum\dtlforeachlevel>2\relax
\def#1{0}%
\else
\ifnum\dtlforeachlevel<0\relax
\def#1{0}%
\else
\@dtl@tmpcount=\dtlforeachlevel
\advance\@dtl@tmpcount by 1\relax
\edef#1{\expandafter\number
\csname c@DTLrow\romannumeral\@dtl@tmpcount\endcsname}%
\fi
\fi}
```


DTLenvforeach Environment form of \DTLforeach (contents are gathered, so verbatim can't be used).

```
\newenvironment{DTLenvforeach}[3][\boolean{true}]{%
  {%
    \def\@dtlenvforeach@args{[#1]{#2}{#3}}%
    \long@collect@body\@do@dtlenvforeach
  }%
  {}
  \newcommand{\@do@dtlenvforeach}[1]{%
    \expandafter\@DTLforeach\@dtlenvforeach@args{#1}%
  }
```

DTLenvforeach* Environment form of \DTLforeach* (contents are gathered, so verbatim can't be used).

```
\newenvironment{DTLenvforeach*}[3][\boolean{true}]{%
  {%
    \def\s@dtlenvforeach@args{[#1]{#2}{#3}}%
    \long@collect@body\@do@sdtlenvforeach
  }%
  {}
  \newcommand{\@do@sdtlenvforeach}[1]{%
    \expandafter\s@DTLforeach\s@dtlenvforeach@args{#1}%
  }
```

\DTLforeach `\DTLforeach[<conditions>]{<db name>}{<values>}{<text>}`

For each row of data in the database given by *<db name>*, do *<text>*, if the specified conditions are satisfied. The argument *{<values>}* is a comma separated list of *<cmd>=<key>* pairs. At the start of each row, each of the commands in this list are set to the value of the entry with the corresponding key *<key>*. (\gdef is used to ensure \DTLforeach works in a tabular environment.) The database may be edited in the unstarred version, in the starred version the database is read only.

```
\newcommand*\@DTLforeach{\@ifstar\s@DTLforeach\@DTLforeach}
```

\@DTLforeach \@DTLforeach is the unstarred version of \DTLforeach. The database is reconstructed to allow for rows to be edited. Use the starred version for faster access.

```
\newcommand{\@DTLforeach}[4][\boolean{true}]{%
```

Check database exists

```
\DTLifdbexists{#2}%
{%
```

Keep hyperref happy

```
\refstepcounter{DTLrow}%
```

Make it global (so that it works in tabular environment)

```
\global\c@DTLrow=\c@DTLrow\relax
```

Store database name

```
\gdef\@dtl@dbname{#2}%
```

Increment level and check not exceeded 3

```
\global\advance\dtlforeachlevel by 1\relax
\ifnum\dtlforeachlevel>3\relax
  \PackageError{datatool}{\string\DTLforeach\space nested too
    deeply}{Only 3 levels are allowed}%
\else
  \@DTLifdbempty{#2}%
```

Do nothing if database is empty

```
{}%
{%
```

Set level dependent information (needs to be global to ensure it works in the tabular environment). Row counter:

```
\expandafter\global
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
= 0\relax
```

Store previous value of \DTLiffirstrow

```
\expandafter\global\expandafter\let%
\csname @dtl@iffirstrow\the\dtlforeachlevel\endcsname
\DTLiffirstrow
```

Define current \DTLiffirstrow

```
\gdef\DTLiffirstrow##1##2{%
  \expandafter\ifnum
  \csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
  =1\relax
  ##1%
\else
  ##2%
\fi}%
```

Store previous value of \DTLiflastrow

```
\expandafter\global\expandafter\let%
\csname @dtl@iflastrow\the\dtlforeachlevel\endcsname
\DTLiflastrow
```

Define current \DTLiflastrow

```
\gdef\DTLiflastrow##1##2{%
  \expandafter\ifnum
  \csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
  =\csname dtlcols@#2\endcsname\relax
  ##1%
\else
  ##2%
\fi}%
```

Store previous value of \DTLifodddrow

```
\expandafter\global\expandafter\let%
\csname @dtl@ifodddrow\the\dtlforeachlevel\endcsname
\DTLifodddrow
```

Define current \DTLifodddrow

```
\gdef\DTLifodddrow##1##2{%
\expandafter\ifodd
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
##1%
\else
##2%
\fi}%
```

Store data base name for current level

```
\expandafter\global\expandafter\let
\csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname
=\@dtl@dbname
```

Mark it as not read only

```
\expandafter\global\expandafter\let
\csname @dtl@ro@\romannumeral\dtlforeachlevel\endcsname
= 0\relax
```

Loop through each row. Loop counter given by \dtl@row<level>

```
\dtlforint
\csname dtl@row\romannumeral\dtlforeachlevel\endcsname
=1\to\csname dtlrows@#2\endcsname\step1\do
{%
```

Get current row from the data base

```
\@dtl@tmpcount=
\csname dtl@row\romannumeral\dtlforeachlevel\endcsname
\edef\dtl@dogetrow{\noexpand\dtlgetrow{#2}%
{\number\@dtl@tmpcount}}%
\dtl@dogetrow
```

Store the current row for this level

```
\expandafter\global
\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
= \dtlcurrentrow
```

Store the previous rows for this level

```
\expandafter\global
\csname @dtl@prev\romannumeral\dtlforeachlevel\endcsname
= \dtlbeforerow
```

Store the subsequent rows for this level

```
\expandafter\global
\csname @dtl@next\romannumeral\dtlforeachlevel\endcsname
= \dtlafterrow
```

Assign commands to the required entries

```
\ifx\relax#3\relax
\else
\@dtl@assign{#3}{#2}%
\fi
```

Do the main body of text if condition is satisfied

```
\ifthenelse{#1}%
{%
```

Increment user row counter

```
\refstepcounter{DTLrow\romannumeral\dtlforeachlevel}%
\expandafter\edef\expandafter\DTLcurrentindex%
\expandafter{%
\arabic{DTLrow\romannumeral\dtlforeachlevel}}%
#4%
```

Has this row been marked for deletion?

```
\edef\@dtl@tmp{\expandafter\the
\csname @dtl@cur\romannumeral
\dtlforeachlevel\endcsname}%
\ifx\@dtl@tmp\@nnil
```

Row needs to be deleted Decrement row indices for rows with a higher index than this one

```
\expandafter\dtl@decrementrows\expandafter
{\csname @dtl@prev\romannumeral
\dtlforeachlevel\endcsname
}{\csname dtl@row\romannumeral
\dtlforeachlevel\endcsname}%
\expandafter\dtl@decrementrows\expandafter
{\csname @dtl@next\romannumeral
\dtlforeachlevel\endcsname
}{\csname dtl@row\romannumeral
\dtlforeachlevel\endcsname}%
```

Reconstruct data base without this row

```
\edef\@dtl@tmp{%
\expandafter\the
\csname @dtl@prev\romannumeral
\dtlforeachlevel\endcsname
\expandafter\the
\csname @dtl@next\romannumeral
\dtlforeachlevel\endcsname
}%
\expandafter\global\expandafter
\csname dtldb@#2\endcsname\expandafter{\@dtl@tmp}%
```

Decrement the row count for this database:

```
\expandafter\global\expandafter
\advance\csname dtlrows@#2\endcsname by -1\relax
```

Decrement the counter for this loop

```
\expandafter\global\expandafter
\advance\csname dtl@row\romannumeral
\dtlforeachlevel\endcsname by -1\relax
\else
```

Reconstruct data base

```
\@dtl@before=\csname @dtl@prev\romannumeral
\dtlforeachlevel\endcsname
\@dtl@after=\csname @dtl@next\romannumeral
\dtlforeachlevel\endcsname
\toks@gconcat@middle@cx{dtldb@#2}%
{\@dtl@before}%
{%
```

This row

```
\noexpand\db@row@elt@w%
\noexpand\db@row@id@w \expandafter\number
\csname dtl@row\romannumeral
\dtlforeachlevel\endcsname
\noexpand\db@row@id@end@%
\expandafter\the
\csname @dtl@cur\romannumeral
\dtlforeachlevel\endcsname
\noexpand\db@row@id@w \expandafter\number
\csname dtl@row\romannumeral
\dtlforeachlevel\endcsname
\noexpand\db@row@id@end@%
\noexpand\db@row@elt@end@%
}%
{\@dtl@after}%
\fi
}%
```

Condition not met so ignore

```
{}%
}%
```

Restore previous value of \DTLiffirstrow

```
\expandafter\global\expandafter\let\expandafter\DTLiffirstrow
\csname @dtl@iffirstrow\the\dtlforeachlevel\endcsname
```

Restore previous value of \DTLiflastrow

```
\expandafter\global\expandafter\let\expandafter\DTLiflastrow
\csname @dtl@iflastrow\the\dtlforeachlevel\endcsname
```

Restore previous value of \DTLifoddrow

```
\expandafter\global\expandafter\let\expandafter\DTLifoddrow
\csname @dtl@ifoddrow\the\dtlforeachlevel\endcsname
}%
\fi
```

Decrement level

```
\global\advance\dtlforeachlevel by -1\relax  
}%
```

else part (data base doesn't exist):

```
{%  
  \PackageError{datatool}{Database '#2' doesn't exist}{}%  
}%  
}
```

\@sDTLforeach \@sDTLforeach is the starred version of \DTLforeach. The database rows can't be edited.

```
\newcommand{\@sDTLforeach}[4][\boolean{true}]{%
```

Check database exists

```
\DTLifdbexists{#2}%  
{%
```

Keep hyperref happy

```
\refstepcounter{DTLrow}%
```

Make it global (so that it works in tabular environment)

```
\global\c@DTLrow=\c@DTLrow
```

Increment level and check not exceeded 3

```
\global\advance\dtlforeachlevel by 1\relax  
\ifnum\dtlforeachlevel>3\relax  
  \PackageError{datatool}{\string\DTLforeach\space nested too  
    deeply}{Only 3 levels are allowed}%  
\else  
  \@DTLifdbempty{#2}%
```

Do nothing if database is empty

```
{}%  
{%
```

Set level dependent information (needs to be global to ensure it works in the tabular environment). Row counter:

```
\expandafter\global  
  \csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname  
    = 0\relax
```

Store previous value of \DTLiffirstrow

```
\expandafter\global\expandafter\let%  
  \csname @dtl@iffirstrow\the\dtlforeachlevel\endcsname  
  \DTLiffirstrow
```

Define current \DTLiffirstrow

```
\gdef\DTLiffirstrow##1##2{%  
  \expandafter\ifnum  
    \csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname  
      =1\relax
```

```

        ##1%
    \else
        ##2%
    \fi}%

Store previous value of \DTLiflastrow
\expandafter\global\expandafter\let%
\csname @dtl@iflastrow\the\dtlforeachlevel\endcsname
\DTLiflastrow

Define current \DTLiflastrow
\gdef\DTLiflastrow##1##2{%
\expandafter\ifnum
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
=\csname dtlcols@#2\endcsname\relax
##1%
\else
##2%
\fi}%

Store previous value of \DTLifoddrow
\expandafter\global\expandafter\let%
\csname @dtl@ifoddrow\the\dtlforeachlevel\endcsname
\DTLifoddrow

Define current \DTLifoddrow
\gdef\DTLifoddrow##1##2{%
\expandafter\ifodd
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname
##1%
\else
##2%
\fi}%

Store data base name for current level
\expandafter\gdef\csname @dtl@dbname@\romannumeral
\dtlforeachlevel\endcsname{#2}%

Mark it as read only
\expandafter\global\expandafter\let
\csname @dtl@ro@\romannumeral\dtlforeachlevel\endcsname
= 1\relax

Iterate through each row.
\@dtlforeachrow(\dtl@thisidx,\dtl@thisrow)\in{#2}\do%
{%

Assign row number (not sure if this is needed here)
\csname dtl@row\romannumeral\dtlforeachlevel\endcsname
= \dtl@thisidx\relax

Store the current row specs for this level
\expandafter\global

```

```

\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
= \expandafter{\dtl@thisrow}%

Assign commands to the required entries
\ifx\relax#3\relax
\else
Need to set \dtlcurrentrow for \@dtl@assign
\dtlcurrentrow=\expandafter{\dtl@thisrow}%
\@dtl@assign{#3}{#2}%
\fi

Do the main body of text if condition is satisfied
\ifthenelse{#1}%
{%

Increment user row counter
\refstepcounter{DTLrow\romannumeral\dtlforeachlevel}%
\expandafter\edef\expandafter\DTLcurrentindex%
\expandafter{%
\arabic{DTLrow\romannumeral\dtlforeachlevel}}%
#4%
}%

Condition not met so ignore
{}%
}%

Restore previous value of \DTLiffirstrow
\expandafter\global\expandafter\let\expandafter\DTLiffirstrow
\csname @dtl@iffirstrow\the\dtlforeachlevel\endcsname

Restore previous value of \DTLiflastrow
\expandafter\global\expandafter\let\expandafter\DTLiflastrow
\csname @dtl@iflastrow\the\dtlforeachlevel\endcsname

Restore previous value of \DTLifoddrow
\expandafter\global\expandafter\let\expandafter\DTLifoddrow
\csname @dtl@ifoddrow\the\dtlforeachlevel\endcsname
}%
\fi

Decrement level
\global\advance\dtlforeachlevel by -1\relax
}%

else part (data base doesn't exist):
{%
\PackageError{datatool}{Database '#2' doesn't exist}{}%
}%
}

```


`\@dtlifreadonly` `\@dtlifreadonly{<true part>}{<false part>}`

Checks if current loop level is read only

```
\newcommand*{\@dtlifreadonly}[2]{%
  \expandafter\ifx
    \csname @dtl@ro@\romannumeral\dtlforeachlevel\endcsname\relax
```

Read only

```
    #1%
  \else
```

Not read only

```
    #2%
  \fi
}
```

`\DTLappendtorow` `\DTLappendtorow{<key>}{<value>}`

Appends entry to current row. (The current row is given by `\@dtl@cur<n>` where `<n>` is roman numeral value of `\dtlforeachlevel`. One level expansion is applied to `<value>`).

```
\newcommand*{\DTLappendtorow}[2]{%
  \ifnum\dtlforeachlevel=0\relax
    \PackageError{datatool}{\string\DTLappendtorow\space can only be
      used inside \string\DTLforeach}{}%
  \else
```

Set `\@dtl@thisdb` to the current database name:

```
  \expandafter\let\expandafter\@dtl@thisdb
    \csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname
```

Check this isn't in `\DTLforeach*`

```
\@dtlifreadonly
{%
  \PackageError{datatool}{\string\DTLappendtorow\space can't
    be used inside \DTLforeach*}{The starred version of
    \string\DTLforeach\space is read only}%
}%
{%
```

Store current row number in `\dtlrownum`

```
\dtlrownum=
  \csname dtl@row\romannumeral\dtlforeachlevel\endcsname\relax
```

Update information about this column (adding new column if necessary)

```
\@dtl@updatekeys{\@dtl@thisdb}{#1}{#2}%
```

Get column index and store in `\dtlcolumnnum`

```
\expandafter\dtlcolumnnum\expandafter
  =\dtlcolumnindex{\@dtl@thisdb}{#1}\relax
```

Set `\dtlcurrentrow` to the current row

```
\dtlcurrentrow =  
  \csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
```

Does this row already have an entry with this key?

```
\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow  
  {\noexpand\dtl@entry}{\number\dtlcolumnnum}%  
}%  
\dtl@dogetentry  
\ifx\dtl@entry\dtlnovalue
```

There are no entries in this row for the given key. Expand entry value before storing.

```
\protected@edef\@dtl@tmp{#2}%  
\expandafter\@dtl@toks\expandafter{\@dtl@tmp}%
```

Append this entry to the current row.

```
\toks@gput@right@cx{\@dtl@cur\romannumeral\dtlforeachlevel}%  
{%  
  \noexpand\db@col@id@w \number\dtlcolumnnum  
  \noexpand\db@col@id@end@  
  \noexpand\db@col@elt@w \the\@dtl@toks  
  \noexpand\db@col@elt@end@  
  \noexpand\db@col@id@w \number\dtlcolumnnum  
  \noexpand\db@col@id@end@  
}%
```

Print information to terminal and log file if in verbose mode.

```
\dtl@message{Appended #1\space -> #2\space to database  
  '\@dtl@thisdb'}%  
\else
```

There is already an entry in this row for the given key

```
\PackageError{datatool}{Can't append entry to row:  
  there is already an entry for key '#1' in this row}{}%  
\fi  
}%  
\fi  
}
```

`\DTLremoveentryfromrow`

`\DTLremoveentryfromrow{<key>}`

Removes entry given by `<key>` from current row. (The current row is given by `\@dtl@cur<n>` where `<n>` is roman numeral value of `\dtlforeachlevel`.)

```
\newcommand*\DTLremoveentryfromrow[1]{%  
  \ifnum\dtlforeachlevel=0\relax  
    \PackageError{datatool}{\string\DTLremoventryfromrow\space  
      can only be used inside \string\DTLforeach}{}%  
  \else
```

Set \@dtl@thisdb to the current database name:

```
\expandafter\let\expandafter\@dtl@thisdb
\csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname
```

Check this isn't in \DTLforeach*

```
\@dtlifreadonly
{%
  \PackageError{datatool}{\string\DTLremoveentryfromrow\space
    can't be used inside \string\DTLforeach*}{The starred
    version of \string\DTLforeach\space is read only}%
}%
{%
```

Store current row number in \dtlrownum

```
\dtlrownum=
\csname dtl@row\romannumeral\dtlforeachlevel\endcsname\relax
```

Is there a column corresponding to this key?

```
\@DTLifhaskey{\@dtl@thisdb}{#1}%
{%
```

There exists a column for this key, so get the index:

```
\@dtl@getcolumnindex{\thiscol}{\@dtl@thisdb}{#1}\relax
\dtlcolumnnum=\thiscol\relax
```

Set \dtlcurrentrow to the current row

```
\dtlcurrentrow =
\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
```

Does this row have an entry with this key?

```
\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow
  {\noexpand\dtl@entry}{\number\dtlcolumnnum}%
}%
\dtl@dogetentry
\ifx\dtl@entry\dtlnovalue
```

This row doesn't contain an entry with this key

```
\PackageError{datatool}{Can't remove entry given by '#1'
  from current row in database '\@dtl@thisdb': no such
  entry}{The current row doesn't contain an entry for
  key '#1'}%
\else
```

Split the current row around the unwanted entry

```
\edef\@dtl@dosplitrow{%
  \noexpand\dtlsplitrow{\the\dtlcurrentrow}%
  {\number\dtlcolumnnum}{\noexpand\dtl@pre}%
  {\noexpand\dtl@post}%
}%
\@dtl@dosplitrow
```

Reconstruct row without unwanted entry

```

\expandafter\@dtl@toks\expandafter{\dtl@pre}%
\expandafter\toks@\expandafter{\dtl@post}%
\edef\@dtl@tmp{\the\@dtl@toks \the\toks@}%
\dtlcurrentrow=\expandafter{\@dtl@tmp}%
\expandafter\global
\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
= \dtlcurrentrow
\dtl@message{Removed entry given by #1\space from current
row of database '\@dtl@thisdb'}%
\fi
}%
{%
\PackageError{datatool}{Can't remove entry given by
'#1' - no such key exists}{}%
}%
}%
\fi
}

```

DTLreplaceentryforrow

`\DTLreplaceentryforrow{<key>}{<value>}`

Replaces entry given by *<key>* in current row with *<value>*. (The current row is given by the token register `\@dtl@cur<n>` where *<n>* is roman numeral value of `\dtlforeachlevel`).

```

\newcommand*{\DTLreplaceentryforrow}[2]{%
\ifnum\dtlforeachlevel=0\relax
\PackageError{datatool}{\string\DTLreplaceentryforrow\space
can only be used inside \string\DTLforeach}{}%
\else

```

Set `\@dtl@thisdb` to the current database name:

```

\expandafter\let\expandafter\@dtl@thisdb
\csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname

```

Check this isn't in `\DTLforeach*`

```

\@dtlifreadonly
{%
\PackageError{datatool}{\string\DTLreplaceentryforrow\space
can't be used inside \string\DTLforeach*}{The starred version
of \string\DTLforeach\space is read only}%
}%
{%

```

Store current row number in `\dtlrownum`

```

\dtlrownum=
\csname dtl@row\romannumeral\dtlforeachlevel\endcsname\relax

```

Is there a column corresponding to this key?

```
\@DTLifhaskey{\@dtl@thisdb}{#1}%
{%
```

There exists a column for this key, so get the index:

```
\@dtl@getcolumnindex{\thiscol}{\@dtl@thisdb}{#1}\relax
\dtlcolumnnum=\thiscol\relax
```

Set \dtlcurrentrow to the current row

```
\dtlcurrentrow =
\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
```

Does this row have an entry with this key?

```
\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow
{\noexpand\dtl@entry}{\number\dtlcolumnnum}%
}%
\dtl@dogetentry
\ifx\dtl@entry\dtlnovalue
```

This row doesn't contain an entry with this key

```
\PackageError{datatool}{Can't replace entry given by '#1'
from current row in database '\@dtl@thisdb': no such
entry}{The current row doesn't contain an entry for
key '#1'}%
\else
```

Split the current row around the requested entry

```
\edef\@dtl@dosplitrow{%
\noexpand\dtlsplitrow{\the\dtlcurrentrow}%
{\number\dtlcolumnnum}{\noexpand\dtl@pre}%
{\noexpand\dtl@post}%
}%
\@dtl@dosplitrow
```

Reconstruct row with new value (given by #2).

```
\protected@edef\@dtl@tmp{#2}%
\expandafter\@dtl@toks\expandafter{\@dtl@tmp}% new value
\expandafter\@dtl@before\expandafter{\dtl@pre}%
\expandafter\@dtl@after\expandafter{\dtl@post}%
\toks@gconcat@middle@cx
{\@dtl@cur\romannumeral\dtlforeachlevel}%
{\@dtl@before}%
{%
\noexpand\db@col@id@w \number\dtlcolumnnum
\noexpand\db@col@id@end@%
\noexpand\db@col@elt@w \the\@dtl@toks
\noexpand\db@col@elt@end@%
\noexpand\db@col@id@w \number\dtlcolumnnum
\noexpand\db@col@id@end@%
}%
{\@dtl@after}%
```

Print information to terminal and log file if in verbose mode.

```

        \dtl@message{Updated #1\space -> #2\space in database
        '\@dtl@thisdb'}}}%
    \fi
}%
{%

```

There doesn't exist a column for this key.

```

        \PackageError{datatool}{Can't replace key '#1' - no such
        key in database '\@dtl@thisdb'}}{%
    }%
}%
\fi
}

```

\DTLremovecurrentrow

\DTLremovecurrentrow

Removes current row. This just sets the current row to empty

```

\newcommand*{\DTLremovecurrentrow}{%
  \ifnum\dtlforeachlevel=0\relax
    \PackageError{datatool}{\string\DTLremovecurrentrow\space can
    only be used inside \string\DTLforeach}{}%
  \else

```

Set \@dtl@thisdb to the current database name:

```

  \expandafter\let\expandafter\@dtl@thisdb
  \csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname

```

Check this isn't in \DTLforeach*

```

  \@dtlifreadonly
  {%
    \PackageError{datatool}{\string\DTLreplaceentryforrow\space
    can't be used inside \string\DTLforeach*}{The starred version
    of \string\DTLforeach\space is read only}%
  }%
  {%

```

Set the current row to \@nil (\DTLforeach needs to check for this)

```

  \expandafter\global
  \csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
  ={\@nil}%
}%
\fi
}

```

\DTLaddentryforrow

\DTLaddentryforrow{<db name>}{<assign
list>}{<condition>}{<key>}{<value>}

Adds the entry with key given by <key> and value given by <value> to the first row in the database <db name> which satisfies the condition given by <condition>.

The *<assign list>* is the same as for `\DTLforeach` and may be used to set the values which are to be tested in *<condition>*.

```
\newcommand{\DTLaddentryforrow}[5]{%
```

Iterate through the data base until condition is met

```
\DTLifdbexists{#1}%
{
  \def\@dtl@notdone{\PackageError{datatool}{Unable to add entry
    given by key ‘#4’: condition not met for any row in database
    ‘#1’}{}}%
}
```

Iterate through each row

```
\DTLforeach[#3]{#1}{#2}%
{%
```

add entry to this row

```
\DTLappendtorow{#4}{#5}%
```

disable error message

```
\let\@dtl@notdone\relax
```

break out of loop

```
\dtlbreak
}%
\@dtl@notdone
}%
{%
  \PackageError{datatool}{Unable to add entry given by key ‘#4’:
    database ‘#1’ doesn’t exist}{}%
}%
}
```

`\DTLforeachkeyinrow`

```
\DTLforeachkeyinrow{<cmd>}{<text>}
```

Iterates through each key in the current row of `\DTLforeach`, and does *<text>*.

```
\newcommand*\DTLforeachkeyinrow[2]{%
  \ifnum\dtlforeachlevel=0\relax
    \PackageError{datatool}{\string\DTLforeachkeyinrow\space can only
      be used inside \string\DTLforeach}{}%
  \else
```

Set `\@dtl@thisdb` to the current database name:

```
\expandafter\let\expandafter\@dtl@thisdb
\csname @dtl@dbname@\romannumeral\dtlforeachlevel\endcsname
```

Iterate through key list

```
\dtlforeachkey(\dtlkey,\dtlcol,\dtltype,\dtlheader)\in
\@dtl@thisdb\do{%
```

store row in `\dtlcurrentrow` (This may get nested so need to do it here instead of outside this loop in case *<text>* changes it.)

```
\dtlcurrentrow =
\csname @dtl@cur\romannumeral\dtlforeachlevel\endcsname
```

Get the value for this key and store in #1

```
\edef\dtl@dogetentry{\noexpand\dtlgetentryfromcurrentrow
{\noexpand#1}{\dtlcol}}%
\dtl@dogetentry
```

Check if null

```
\ifx#1\dtlnovalue
\ifnum0\dtltype=0\relax
```

Data type is *<empty>* or 0, so set to string null.

```
\let#1=\DTLstringnull
\else
```

Data type is numerical, so set to number null.

```
\let#1=\DTLnumbernull
\fi
\fi
```

Make #1 global in case this is in a tabular environment (or something similar)

```
\global\let#1#1%
```

Store loop body so that any scoping commands (such as `&`) don't cause a problem for `\ifx`

```
\def\@dtl@loop@body{#2}%
\@dtl@loop@body
}%
\fi
}
```

4.6 DTLforeach Conditionals

The following conditionals are only meant to be used within `\DTLforeach` as they depend on the counter `DTLrow<n>`.

`\DTLiffirstrow` `\DTLiffirstrow{<true part>}{<>false part>}`

Test if the current row is the first row. (This takes *<condition>*, the optional argument of `\DTLforeach`, into account, so it may not correspond to row 1 of the database.) Can only be used in `\DTLforeachrow`.

```
\newcommand{\DTLiffirstrow}[2]{%
\PackageError{datatool}{\string\DTLiffirstrow\space can only
be used inside \string\DTLforeach}{}%
}
```


`\DTLiflastrow` `\DTLiflastrow{<true part>}{<false part>}`

Checks if the current row is the last row of the database. It doesn't take the condition (the optional argument of `\DTLforeach`) into account, so its possible it may never do *<true part>*, as the last row of the database may not meet the condition. It is therefore not very useful and is confusing since it behaves differently to `\DTLiffirstrow` which does take the condition into account, so I have removed its description from the main part of the manual. If you need to use the optional argument of `\DTLforeach`, you will first have to iterate through the database to count up the number of rows which meet the condition, and then do another pass, checking if the current row has reached that number.

```
\newcommand{\DTLiflastrow}[2]{%
  \PackageError{datatool}{\string\DTLiflastrow\space can only
    be used inside \string\DTLforeach}{}%
}
```

`\DTLifoddrow` `\DTLifoddrow{<true part>}{<false part>}`

Determines whether the current row is odd (takes the optional argument of `\DTLforeach` into account.)

```
\newcommand{\DTLifoddrow}[2]{%
  \PackageError{datatool}{\string\DTLifoddrow\space can only
    be used inside \string\DTLforeach}{}%
}
```

4.7 Displaying Database

This section defines commands to display the entire database in a tabular or longtable environment.

<code>\dtlbetweencols</code>	This specifies what to put between the column alignment specifiers. <code>\newcommand*{\dtlbetweencols}{}</code>
<code>\dtlbeforecols</code>	This specifies what to put before the first column alignment specifier. <code>\newcommand*{\dtlbeforecols}{}</code>
<code>\dtlaftercols</code>	This specifies what to put after the last column alignment specifier. <code>\newcommand*{\dtlaftercols}{}</code>
<code>\dtlstringalign</code>	Alignment character for columns containing strings <code>\newcommand*{\dtlstringalign}{l}</code>
<code>\dtlintalign</code>	Alignment character for columns containing integers <code>\newcommand*{\dtlintalign}{r}</code>

`\dtlrealalign` Alignment character for columns containing real numbers
`\newcommand*{\dtlrealalign}{r}`

`\dtlcurrencyalign` Alignment character for columns containing currency numbers
`\newcommand*{\dtlcurrencyalign}{r}`

`\dtladdalign` `\dtladdalign{<cs>}{<type>}{<col num>}{<max cols>}`

Adds tabular column alignment character to `<cs>` for column `<col num>` which contains data type `<type>`.

```
\newcommand*{\dtladdalign}[4]{%
  \ifnum#3=1\relax
    \protected@edef#1{\dtlbeforecols}%
  \else
    \protected@edef#1{#1\dtlbetweencols}%
  \fi
  \ifstrempy{#2}%
  {%
    \protected@edef#1{#1c}%
  }%
  {%
    \ifcase#2\relax
```

string

```
\protected@edef#1{#1\dtlstringalign}%
\or
```

integer

```
\protected@edef#1{#1\dtlintalign}%
\or
```

real number

```
\protected@edef#1{#1\dtlrealalign}%
\or
```

currency

```
\protected@edef#1{#1\dtlcurrencyalign}%
\else
```

Unknown type

```
\protected@edef#1{#1c}%
\PackageError{datatool}{Unknown data type ‘#2’}{}%
\fi
```

```
}%
\ifnum#3=#4\relax
  \protected@edef#1{#1\dtlaftercols}%
\fi
```

```
}
```

<code>\dtlheaderformat</code>	<code>\dtlheaderformat{<text>}</code>	Specifies how to format the column title. <code>\newcommand*{\dtlheaderformat}[1]{\null\hfil\textbf{#1}\hfil\null}</code>
<code>\dtlstringformat</code>	<code>\dtlstringformat{<text>}</code>	Specifies how to format entries in columns with string data type. <code>\newcommand*{\dtlstringformat}[1]{#1}</code>
<code>\dtlintformat</code>	<code>\dtlintformat{<text>}</code>	Specifies how to format entries in columns with integer data type. <code>\newcommand*{\dtlintformat}[1]{#1}</code>
<code>\dtlrealformat</code>	<code>\dtlrealformat{<text>}</code>	Specifies how to format entries in columns with real data type. <code>\newcommand*{\dtlrealformat}[1]{#1}</code>
<code>\dtlcurrencyformat</code>	<code>\dtlcurrencyformat{<text>}</code>	Specifies how to format entries in columns with currency data type. <code>\newcommand*{\dtlcurrencyformat}[1]{#1}</code>
<code>\dtldisplaystarttab</code>	Indicates what to do just after <code>\begin{tabular}{<column specs>}</code> (e.g. <code>\hline</code>). <code>\newcommand*{\dtldisplaystarttab}{}</code>	
<code>\dtldisplayendtab</code>	Indicates what to do just before <code>\end{tabular}</code> . <code>\newcommand*{\dtldisplayendtab}{}</code>	
<code>\dtldisplayafterhead</code>	Indicates what to do after the header row, before the first row of data. <code>\newcommand*{\dtldisplayafterhead}{}</code>	
<code>\dtldisplaystartrow</code>	Indicates what to do at the start of each row (not including the header row or the first row of data). <code>\newcommand*{\dtldisplaystartrow}{}</code>	

`\DTLdisplaydb` `\DTLdisplaydb[\langle omit list \rangle]{\langle db \rangle}`

Displays the database $\langle db \rangle$ in a tabular environment.

```
\newcommand*{\DTLdisplaydb}[2] [] {%
```

Initialise: only want & between columns

```
\def\@dtl@doamp{\gdef\@dtl@doamp{&}}
\def\@dtl@resetdoamp{\gdef\@dtl@doamp{\gdef\@dtl@doamp{&}}}
```

Store maximum number of columns

```
\edef\@dtl@maxcols{\expandafter\number
\csname dtlcols@#2\endcsname}%
```

Subtract number of omitted columns

```
\DTLnumitemsinlist{#1}{\@dtl@tmp}%
\dtlsub{\@dtl@maxcols}{\@dtl@maxcols}{\@dtl@tmp}%
\dtlclip{\@dtl@maxcols}{\@dtl@maxcols}%
```

Argument for tabular environment

```
\def\@dtl@tabargs{%
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
\in{#2}\do
{%
\expandafter\DTLifinlist\expandafter{\@dtl@key}{#1}%
}%
{%
\dtladdalign\@dtl@tabargs\@dtl@type\@dtl@idx\@dtl@maxcols
}
}%
```

Begin tabular environment

```
\edef\@dtl@dobegintab{\noexpand\begin{tabular}{\@dtl@tabargs}}%
\@dtl@dobegintab
```

Do start hook

```
\dtldisplaystarttab
```

Reset $\backslash\@dtl@doamp$ so it doesn't do an ampersand at the start of the first column.

```
\@dtl@resetdoamp
```

Do the header row.

```
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
\in{#2}\do
{%
\expandafter\DTLifinlist\expandafter{\@dtl@key}{#1}%
}%
{%
\@dtl@doamp
\dtlheaderformat{\@dtl@head}%
}%
}%
```

```

\\%
Do the after header hook
\dtldisplayafterhead
Reset \@dtl@doamp so it doesn't do an ampersand at the start of the first col-
umn.
\@dtl@resetdoamp
Iterate through each row of the database
\@sDTLforeach{#2}{-}{%
Do the start row hook if not the first row
\DTLiffirstrow{-}{\\dtldisplaystartrow}%
Reset \@dtl@doamp so it doesn't do an ampersand at the start of the first col-
umn.
\@dtl@resetdoamp
Iterate through each column.
\DTLforeachkeyinrow{-\@dtl@val}%
{-%
\expandafter\DTLifinlist\expandafter{-\dtlkey}{#1}%
-}%
{-%
Need to make value global as it needs to be used after the ampersand.
\global\let\@dtl@val\@dtl@val
\@dtl@doamp
\DTLforeachkeyinrow sets \dtltype to the data type for the current key. This
can be used to determine which format to use for this entry.
\@dtl@datatype=0\dtltype\relax
\ifcase\@dtl@datatype
\dtlstringformat\@dtl@val
\or
\dtlintformat\@dtl@val
\or
\dtlrealformat\@dtl@val
\or
\dtlcurrencyformat\@dtl@val
\else
\@dtl@val
\fi
}%
}%
\dtldisplayendtab
\end{tabular}%
}

```

Define keys to use in the optional argument of `\DTLdisplaylongdb`.
The caption key sets the caption for the longtable.

```
\define@key{displaylong}{caption}{\def\@dtl@cap{#1}}
```

The contcaption key sets the continuation caption for the longtable.

```
\define@key{displaylong}{contcaption}{\def\@dtl@contcap{#1}}
```

The shortcaption key sets the lof caption for the longtable.

```
\define@key{displaylong}{shortcaption}{\def\@dtl@shortcap{#1}}
```

The label key sets the label for the longtable.

```
\define@key{displaylong}{label}{\def\@dtl@label{#1}}
```

The foot key sets the longtable foot

```
\define@key{displaylong}{foot}{\def\@dtl@foot{#1}}
```

The lastfoot key sets the longtable last foot

```
\define@key{displaylong}{lastfoot}{\def\@dtl@lastfoot{#1}}
```

List of omitted columns

```
\define@key{displaylong}{omit}{\def\@dtl@omitlist{#1}}
```

`\dtl@resetdostartrow` Resets start row hook so that it skips the first row.

```
\newcommand*{\@dtl@resetdostartrow}{%
  \gdef\@dtl@dostartrow{%
    \gdef\@dtl@dostartrow{\@dtl@displaystartrow}}%
}
```

`\DTLdisplaylongdb` `\DTLdisplaylongdb[<options>]{<db>}`

Displays the database *<db>* in a longtable environment. (User needs to load longtable).

```
\newcommand*{\DTLdisplaylongdb}[2][]{%}
```

Initialise.

```
\def\@dtl@cap{\@nil}%
\def\@dtl@contcap{\@nil}%
\def\@dtl@label{\@nil}%
\def\@dtl@shortcap{\@dtl@cap}%
\def\@dtl@foot{\@nil}%
\def\@dtl@lastfoot{\@nil}%
\def\@dtl@omitlist{}
```

Set the options

```
\setkeys{displaylong}{#1}%
```

Only want & between columns

```
\def\@dtl@doamp{\gdef\@dtl@doamp{&}}
\def\@dtl@resetdoamp{\gdef\@dtl@doamp{\gdef\@dtl@doamp{&}}}
\@dtl@resetdostartrow
```

Store maximum number of columns

```
\edef\@dtl@maxcols{\expandafter\number
\csname dtlcols@#2\endcsname}%
```

Subtract number of omitted columns

```
\DTLnumitemsinlist{\@dtl@omitlist}{\@dtl@tmp}%
\dtlsub{\@dtl@maxcols}{\@dtl@maxcols}{\@dtl@tmp}%
\dtlclip{\@dtl@maxcols}{\@dtl@maxcols}%
```

Argument for longtable environment

```
\def\@dtl@tabargs{%
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
\in{#2}\do
{%
\expandafter\DTLifinlist\expandafter{\@dtl@key}{\@dtl@omitlist}%
}%
{%
\dtladdalign\@dtl@tabargs\@dtl@type\@dtl@idx\@dtl@maxcols
}%
}%
```

Start the longtable environment.

```
\edef\@dtl@dobegintab{\noexpand\begin{longtable}{\@dtl@tabargs}}%
\@dtl@dobegintab
```

Do start hook.

```
\dtldisplaystarttab
```

Is a foot required?

```
\ifx\@dtl@foot\@nnil
\else
\@dtl@foot\endfoot
\fi
```

Is a last foot required?

```
\ifx\@dtl@lastfoot\@nnil
\else
\@dtl@lastfoot\endlastfoot
\fi
```

Is a caption required?

```
\ifx\@dtl@cap\@nnil
```

No caption required, just do header row.

```
\@dtl@resetdoamp
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
\in{#2}\do
{%
\expandafter\DTLifinlist\expandafter{\@dtl@key}{\@dtl@omitlist}%
}%
{%
\@dtl@doamp{\dtlheaderformat{\@dtl@head}}%
```

```

    }%
  }%
  \@dtl@resetdoamp
  \@dtl@resetdostartrow
  \endhead\dtldisplayafterhead
\else

```

Caption is required

```
\caption[\@dtl@shortcap]{\@dtl@cap}%
```

Is a label required?

```

\ifx\@dtl@label\@nnil
\else
  \label{\@dtl@label}%
\fi
\\%

```

Do header row.

```

\@dtl@resetdoamp
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
  \in{#2}\do
  {%
    \expandafter\DTLifinlist\expandafter{\@dtl@key}{\@dtl@omitlist}%
    {}%
    {%
      \@dtl@doamp{\dtlheaderformat{\@dtl@head}}%
    }%
  }%
\@dtl@resetdoamp
\@dtl@resetdostartrow
\endfirsthead

```

Is a continuation caption required?

```

\ifx\@dtl@contcap\@nnil
  \caption{\@dtl@cap}%
\else
  \caption{\@dtl@contcap}%
\fi
\\%

```

Do header row.

```

\@dtl@resetdoamp
\dtlforeachkey(\@dtl@key,\@dtl@idx,\@dtl@type,\@dtl@head)%
  \in{#2}\do
  {%
    \expandafter\DTLifinlist\expandafter{\@dtl@key}{\@dtl@omitlist}%
    {}%
    {%
      \@dtl@doamp{\dtlheaderformat{\@dtl@head}}%
    }%
  }%

```



```

\@dtl@resetdoamp
\@dtl@resetdostartrow
\endhead\dtldisplayafterhead
\fi
Iterate through each row of the database
\@sDTLforeach{#2}{-}{%
\@dtl@dostartrow
\@dtl@resetdoamp
Iterate through each column
\DTLforeachkeyinrow{\@dtl@val}%
{%
\global\let\@dtl@val\@dtl@val
\expandafter\DTLifinlist\expandafter{\dtlkey}{\@dtl@omitlist}%
}%
{%
\@dtl@doamp
\DTLforeachkeyinrow sets \dtltype to the data type for the current key. This
can be used to determine which format to use for this entry.
\@dtl@datatype=0\dtltype\relax
\ifcase\@dtl@datatype
\dtlstringformat\@dtl@val
\or
\dtlintformat\@dtl@val
\or
\dtlrealformat\@dtl@val
\or
\dtlcurrencyformat\@dtl@val
\fi
}%
}%
\dtldisplayendtab
\end{longtable}%
}

```

4.8 Editing Databases

`\dtlswaprows` `\dtlswaprows{<db>}{<row1 idx>}{<row2 idx>}`

Swaps the rows with indices *<row1 idx>* and *<row2 idx>* in the database *<db>*.
(Doesn't check if data base exists or if indices are out of bounds.)

```

\newcommand*{\dtlswaprows}[3]{%
\ifnum#2=#3\relax

```

Attempt to swap row with itself: do nothing.

\else

Let row A be the row with the lower index and row B be the row with ther higher index.

```
\ifnum#2<#3\relax
\edef\@dtl@rowAidx{\number#2}%
\edef\@dtl@rowBidx{\number#3}%
\else
\edef\@dtl@rowAidx{\number#3}%
\edef\@dtl@rowBidx{\number#2}%
\fi
```

Split the database around row A.

```
\edef\@dtl@dosplit{\noexpand\dtlgetrow{#1}{\@dtl@rowAidx}}%
\@dtl@dosplit
```

Store first part of database in \@dtl@firstpart.

```
\expandafter\def\expandafter\@dtl@firstpart\expandafter
{\the\dtlbeforerow}%
```

Store row A in \@dtl@toksA.

```
\@dtl@toksA=\dtlcurrentrow
```

Split the second part (everything after row A).

```
\edef\@dtl@dosplit{\noexpand\@dtlgetrow
{\the\dtlafterrow}{\@dtl@rowBidx}}%
\@dtl@dosplit
```

Store the mid part (everything between row A and row B)

```
\expandafter\def\expandafter\@dtl@secondpart\expandafter
{\the\dtlbeforerow}%
```

Store row B in \@dtl@toksB.

```
\@dtl@toksB=\dtlcurrentrow
```

Store the last part (everything after row B).

```
\expandafter\def\expandafter\@dtl@thirdpart\expandafter
{\the\dtlafterrow}%
```

Reconstruct database: store first part in \toks@

```
\toks@=\expandafter{\@dtl@firstpart}%
```

Store mid part in \dtl@toks

```
\@dtl@toks=\expandafter{\@dtl@secondpart}%
```

Format data for first part, row B and mid part.

```
\edef\@dtl@tmp{\the\toks@
\noexpand\db@row@elt@w%
\noexpand\db@row@id@w \@dtl@rowAidx\noexpand\db@row@id@end@%
\the\@dtl@toksB
\noexpand\db@row@id@w \@dtl@rowAidx\noexpand\db@row@id@end@%
\noexpand\db@row@elt@end@%
\the\@dtl@toks}%
```

Store data so far in \toks@.

```
\toks@=\expandafter{\@dtl@tmp}%
```

Store last part in \dtl@toks.

```
\@dtl@toks=\expandafter{\@dtl@thirdpart}%
```

Format row A and end part.

```
\edef\@dtl@tmp{\the\toks@
\noexpand\db@row@elt@w%
\noexpand\db@row@id@w \@dtl@rowBidx\noexpand\db@row@id@end@%
\the\@dtl@toksA
\noexpand\db@row@id@w \@dtl@rowBidx\noexpand\db@row@id@end@%
\noexpand\db@row@elt@end@%
\the\@dtl@toks}%
```

Update the database

```
\expandafter\global\csname dtldb@#1\endcsname=\expandafter
{\@dtl@tmp}%
```

```
\fi
```

```
}
```

\dtl@decrementrows

```
\dtl@decrementrows{\<toks>}{\<n>}
```

decrement by 1 all rows in <toks> with row index above <n>

```
\newcommand*\@dtl@decrementrows}[2]{%
\def\@dtl@newlist{}%
\edef\@dtl@min{\number#2}%
\expandafter\@dtl@decrementrows\the#1%
\db@row@elt@w%
\db@row@id@w \@nil\db@row@id@end@%
\db@row@id@w \@nil\db@row@id@end@%
\db@row@elt@end@%
\@nil
#1=\expandafter{\@dtl@newlist}%
}
```

\@dtl@decrementrows

```
\def\@dtl@decrementrows\db@row@elt@w\db@row@id@w #1\db@row@id@end@%
#2\db@row@id@w #3\db@row@id@end@\db@row@elt@end@#4\@nil{%
\def\@dtl@thisrow{#1}%
\ifx\@dtl@thisrow\@nnil
\let\@dtl@donextdec=\@dtl@gobbletonil
\else
\ifnum\@dtl@thisrow>\@dtl@min
\@dtl@tmpcount=\@dtl@thisrow\relax
\advance\@dtl@tmpcount by -1\relax
\toks@{#2}%
\@dtl@toks=\expandafter{\@dtl@newlist}%
\edef\@dtl@newlist{\the\@dtl@toks
```

```

\noexpand\db@row@elt@w% row header
\noexpand\db@row@id@w \number\@dtl@tmpcount
\noexpand\db@row@id@end@% row id
\the\toks@ % row contents
\noexpand\db@row@id@w \number\@dtl@tmpcount
\noexpand\db@row@id@end@% row id
\noexpand\db@row@elt@end@% row end
}%
\else
\toks@{#2}%
\@dtl@toks=\expandafter{\@dtl@newlist}%
\edef\@dtl@newlist{\the\@dtl@toks
\noexpand\db@row@elt@w% row header
\noexpand\db@row@id@w #1%
\noexpand\db@row@id@end@% row id
\the\toks@ % row contents
\noexpand\db@row@id@w #3%
\noexpand\db@row@id@end@% row id
\noexpand\db@row@elt@end@% row end
}%
\fi
\let\@dtl@donextdec=\@dtl@decrementrows
\fi
\@dtl@donextdec#4\@nil
}

```

\DTLremove row

\DTLremove row{<db>}{<row index>}

Remove row with given index from database named <db>.

```
\newcommand*{\DTLremove row}[2]{%
```

Check database exists

```
\DTLifdbexists{#1}%
{%
```

Check index if index is out of bounds

```
\ifnum#2>0\relax
```

Check if data base has at least <row index> rows

```

\expandafter\ifnum\csname dtlrows@#1\endcsname<#2\relax
\expandafter\ifnum\csname dtlrows@#1\endcsname=1\relax
\PackageError{datatool}{Can't remove row '\number#2' from
database '#1': no such row}{Database '#1' only has
1 row}%
\else
\PackageError{datatool}{Can't remove row '\number#2' from
database '#1': no such row}{Database '#1' only has
\expandafter\number\csname dtlrows@#1\endcsname\space
rows}%

```

```

        \fi
      \else
        \@DTLremoveoverrow{#1}{#2}%
      \fi
    \else
      \PackageError{datatool}{Can't remove row \number#2: index
        out of bounds}{Row indices start at 1}%
    \fi
  }%
}%
\PackageError{datatool}{Can't remove row: database '#1' doesn't
  exist}{}%
}%
}

```

`\@DTLremoveoverrow` `\@DTLremoveoverrow{<db>}{<row index>}`

Doesn't perform any checks for the existence of the database or if the index is in range.

```
\newcommand*{\@DTLremoveoverrow}[2]{%
```

Get row from data base

```

\edef\dtl@dogetrow{\noexpand\dtlgetrow{#1}{\number#2}}%
\dtl@dogetrow

```

Update the row indices

```

\expandafter\dtl@decrementrows\expandafter
  {\dtlbeforerow}{#2}%
\expandafter\dtl@decrementrows\expandafter
  {\dtlafterrow}{#2}%

```

Reconstruct database

```

\edef\dtl@tmp{\the\dtlbeforerow \the\dtlafterrow}%
\expandafter\global\csname dtldb@#1\endcsname
  =\expandafter{\dtl@tmp}%

```

decrement row counter

```

\expandafter\global\expandafter\advance
  \csname dtlrows@#1\endcsname by -1\relax
}

```

4.9 Database Functions

`\DTLsumforkeys` `\DTLsumforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}`

Sums all entries for key *<key>* over all databases listed in *<db list>*, and stores in *<cmd>*, which must be a control sequence. The first argument *<condition>*

is the same as that for \DTLforeach. The second optional argument provides an assignment list to pass to \DTLforeach in case extra information is need by *<condition>*.

```
\newcommand*{\DTLsumforkeys}[1][\boolean{true}]\and
\DTLisnumerical{\DTLthisval}] {%
\def\@dtl@cond{#1}%
\@dtlsumforkeys
}
```

\@dtlsumforkeys

```
\newcommand*{\@dtlsumforkeys}[4][ ] {%
\def#4{0}%
```

Iterate over all the listed data bases

```
\@for\@dtl@dbname:=#2\do{%
```

Iterate through this database (using read only version)

```
\@sDTLforeach{\@dtl@dbname}%
{#1}% assignment list
{%
```

Iterate through key list.

```
\@for\@dtl@key:=#3\do{%
\@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%
\dtlcurrentrow=\expandafter{\dtl@thisrow}%
\dtlgetentryfromrow{\DTLthisval}{\@dtl@col}{\dtlcurrentrow}%
\expandafter\ifthenelse\expandafter{\@dtl@cond}%
{\DTLadd{#4}{#4}{\DTLthisval}}}%
}%
}%
}%
}
```

\DTLsumcolumn

```
\DTLsumcolumn{<db>}{<key>}{<cmd>}
```

Quicker version of \DTLsumforkeys that just sums over one column (specified by *<key>*) for a single database (specified by *<db>*) and stores the result in *<cmd>*.

```
\newcommand*{\DTLsumcolumn}[3] {%
\def#3{0}%
```

Check data base exists

```
\DTLifdbexists{#1}%
{%
```

Check column exists

```
\@sDTLifhaskey{#1}{#2}%
{%
\@sdtlforcolumn{\DTLthisval}{#1}{#2}%
```

```

    {%
      \DTLadd{#3}{#3}{\DTLthisval}%
    }%
  }%

```

key not defined for this data base

```

    {%
      \PackageError{datatool}{Key ‘#2’ doesn’t
        exist in database ‘#1’}{}%
    }%
  }%

```

data base doesn’t exist

```

    {%
      \PackageError{datatool}{Data base ‘#1’ doesn’t
        exist}{}%
    }%
  }

```

```

\DTLmeanforkeys \DTLmeanforkeys[<condition>][<assign list>]{<db list>}{<key
list>}{<cmd>}

```

Computes the arithmetic mean of all entries for each key in *<key list>* over all databases in *<db list>*, and stores in *<cmd>*, which must be a control sequence. The first argument *<condition>* is the same as that for `\DTLforeach`. The second optional argument allows an assignment list to be passed to `\DTLforeach`.

```

\newcommand*\DTLmeanforkeys}[1][\boolean{true}]\and
\DTLisnumerical{\DTLthisval}]{%
  \def\@dtl@cond{#1}%
  \@dtlmeanforkeys
}

```

```

\@dtl@elements Count register to keep track of number of elements
\newcount\@dtl@elements

```

```

\@dtlmeanforkeys
\newcommand*\@dtlmeanforkeys}[4][[]]{%
  \def#4{0}%
  \@dtl@elements=0\relax

```

Iterate over all the listed data bases

```

\@for\@dtl@dbname:=#2\do{%

```

Iterate through this database (using read only version)

```

  \@sDTLforeach{\@dtl@dbname}%
  {#1}% assignment list
  {%

```

Iterate through key list.

```
\@for\@dtl@key:=#3\do{%
  \@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%
  \dtlcurrentrow=\expandafter{\dtl@thisrow}%
  \dtlgetentryfromrow{DTLthisval}{\@dtl@col}{\dtlcurrentrow}%
  \expandafter\ifthenelse\expandafter{\@dtl@cond}%
  {%
    \DTLadd{#4}{#4}{\DTLthisval}%
    \advance\@dtl@elements by 1\relax
  }{%
  }%
}%
}%
}%
```

Divide total by number of elements summed.

```
\ifnum\@dtl@elements=0\relax
% \PackageError{datatool}{Unable to evaluate mean: no data}{}%
\else
\edef\@dtl@n{\number\@dtl@elements}%
\DTLdiv{#4}{#4}{\@dtl@n}%
\fi
}
```

\DTLmeanforcolumn

```
\DTLmeanforcolumn{<db>}{<key>}{<cmd>}
```

Quicker version of \DTLmeanforkeys that just computes the mean over one column (specified by *<key>*) for a single database (specified by *<db>*) and stores the result in *<cmd>*.

```
\newcommand*{\DTLmeanforcolumn}[3]{%
  \def#3{0}%
  \@dtl@elements=0\relax
```

Check data base exists

```
\DTLifdbexists{#1}%
{%
```

Check column exists

```
\@sDTLifhaskey{#1}{#2}%
{%
  \@sdtlforcolumn{\DTLthisval}{#1}{#2}%
  {%
    \DTLadd{#3}{#3}{\DTLthisval}%
    \advance\@dtl@elements by 1\relax
  }%
  \ifnum\@dtl@elements=0\relax
    \PackageError{datatool}{Can't compute mean for
      column '#2' in database '#1': no data}{}%
  \else
    \edef\@dtl@n{\number\@dtl@elements}%
```



```

        \DTLdiv{#3}{#3}{\@dtl@n}%
    \fi
}%
key not defined for this data base
{
    \PackageError{datatool}{Key ‘#2’ doesn’t
        exist in database ‘#1’}{}%
}%
}%
data base doesn’t exist
{
    \PackageError{datatool}{Data base ‘#1’ doesn’t
        exist}{}%
}%
}

```

\DTLvarianceforkeys

```

\DTLvarianceforkeys[<condition>][<assign list>]{<db list>}{<key
list>}{<cmd>}

```

Computes the variance of all entries for each key in *<key list>* over all databases in *<db list>*, and stores in *<cmd>*, which must be a control sequence. The first optional argument *<condition>* is the same as that for \DTLforeach. The second optional argument is an assignment list to pass to \DTLforeach in case it is required for the condition.

```

\newcommand*\DTLvarianceforkeys[1][\boolean{true}]\and
\DTLisnumerical{\DTLthisval}] {%
    \def\@dtl@cond{#1}%
    \@dtlvarianceforkeys
}

```

\@dtlmeanforkeys

```

\newcommand*\@dtlvarianceforkeys[4][ ] {%
    \@dtlmeanforkeys[#1]{#2}{#3}{\@dtl@mean}%
    \def#4{0}%
    \@dtl@elements=0\relax
}

```

Iterate over all the listed data bases

```

\@for\@dtl@dbname:=#2\do{%

```

Iterate through this database (using read only version)

```

    \@sDTLforeach{\@dtl@dbname}%
    {#1}% assignment list
    {%

```

Iterate through key list.

```

        \@for\@dtl@key:=#3\do{%
            \@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%

```

```

\dtlcurrentrow=\expandafter{\dtl@thisrow}%
\dtlgetentryfromrow{\DTLthisval}{\@dtl@col}{\dtlcurrentrow}%
\expandafter\ifthenelse\expandafter{\@dtl@cond}%
{%
compute  $(x_i - \mu)^2$ 
\DTLsub{\dtl@diff}{\DTLthisval}{\dtl@mean}%
\DTLmul{\dtl@diff}{\dtl@diff}{\dtl@diff}%
\DTLadd{#4}{#4}{\dtl@diff}%
\advance\@dtl@elements by 1\relax
}%}%
}%
}%
}

```

Divide by number of elements.

```

\ifnum\@dtl@elements=0\relax
\PackageError{datatool}{Unable to evaluate variance: no data}{}%
\else
\edef\@dtl@n{\number\@dtl@elements}%
\DTLdiv{#4}{#4}{\@dtl@n}%
\fi
}

```

DTLvarianceforcolumn

`\DTLvarianceforcolumn{<db>}{<key>}{<cmd>}`

Quicker version of `\DTLvarianceforkeys` that just computes the variance over one column (specified by `<key>`) for a single database (specified by `<db>`) and stores the result in `<cmd>`.

```

\newcommand*{\DTLvarianceforcolumn}[3]{%
\DTLmeanforcolumn{#1}{#2}{\dtl@mean}%
\def#3{0}%
\@dtl@elements=0\relax

```

Check data base exists

```

\DTLifdbexists{#1}%
{%

```

Check column exists

```

\@sDTLifhaskey{#1}{#2}%
{%
\@sdtlforcolumn{\DTLthisval}{#1}{#2}%
}%

```

compute $(x_i - \mu)^2$

```

\DTLsub{\dtl@diff}{\DTLthisval}{\dtl@mean}%
\DTLmul{\dtl@diff}{\dtl@diff}{\dtl@diff}%
\DTLadd{#3}{#3}{\dtl@diff}%
\advance\@dtl@elements by 1\relax
}%

```

```

\ifnum\@dtl@elements=0\relax
  \PackageError{datatool}{Can't compute variance for
    column '#2' in database '#1': no data}{}%
\else
  \edef\@dtl@n{\number\@dtl@elements}%
  \DTLdiv{#3}{#3}{\@dtl@n}%
\fi
}%
key not defined for this data base
{%
  \PackageError{datatool}{Key '#2' doesn't
    exist in database '#1'}{}%
}%
}%
data base doesn't exist
{%
  \PackageError{datatool}{Data base '#1' doesn't
    exist}{}%
}%
}

```

`\DTLsdforkeys` `\DTLsdforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}`

Computes the standard deviation of all entries for each key in *<key list>* over all databases in *<db list>*, and stores in *<cmd>*, which must be a control sequence. The first optional argument *<condition>* is the same as that for `\DTLforeach`. The second optional argument is an assignment list for `\DTLforeach` in case it is needed for the condition.

```

\newcommand*\DTLsdforkeys[1][\boolean{true}]\and
\DTLisnumerical{\DTLthisval}]{%
  \def\@dtl@cond{#1}%
  \@dtlsdforkeys
}

```

```

\@dtlsdforkeys
\newcommand*\@dtlsdforkeys[4][[]]{%
  \@dtlvarianceforkeys[#1]{#2}{#3}{#4}%
  \DTLsqrt{#4}{#4}%
}

```

`\DTLsdforcolumn` `\DTLsdforcolumn{<db>}{<key>}{<cmd>}`

Quicker version of `\DTLsdforkeys` that just computes the standard deviation over one column (specified by *<key>*) for a single database (specified by *<db>*) and stores the result in *<cmd>*.

```

\newcommand*\DTLsdforcolumn}[3]{%
  \DTLvvarianceforcolumn{#1}-{#2}-{#3}%
  \DTLsqrt{#3}-{#3}%
}

```

```

\DTLminforkeys \DTLminforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}

```

Determines the minimum over all entries for each key in *<key list>* over all databases in *<db list>*, and stores in *<cmd>*, which must be a control sequence. The first optional argument *<condition>* is the same as that for \DTLforeach. The second optional argument is an assignment list for \DTLforeach in the event that extra information is need for the condition.

```

\newcommand*\DTLminforkeys}[1][\boolean{true}\and
  \DTLisnumerical{\DTLthisval}]{%
  \def\@dtl@cond{#1}%
  \@dtlminforkeys
}

```

```

\@dtlminforkeys

```

```

\newcommand*\@dtlminforkeys}[4][[]]{%
  \def#4{}%

```

Iterate over all the listed data bases

```

\@for\@dtl@dbname:=#2\do{%

```

Iterate through this database (using read only version)

```

  \@sDTLforeach{\@dtl@dbname}%
  {#1}% assignment list
  {%

```

Iterate through key list.

```

    \@for\@dtl@key:=#3\do{%
      \@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%
      \dtlcurrentrow=\expandafter{\dtl@thisrow}%
      \dtlgetentryfromrow{\DTLthisval}{\@dtl@col}{\dtlcurrentrow}%
      \expandafter\ifthenelse\expandafter{\@dtl@cond}%
      {%
        \ifstrempy{#4}%
        {%
          \let#4\DTLthisval
        }%
        {%
          \DTLmin{#4}{#4}{\DTLthisval}%
        }%
      }-%
    }-%
  }%
}

```

`\DTLminforcolumn` `\DTLminforcolumn{<db>}{<key>}{<cmd>}`

Quicker version of `\DTLminforkeys` that just finds the minimum value in one column (specified by `<key>`) for a single database (specified by `<db>`) and stores the result in `<cmd>`.

```
\newcommand*{\DTLminforcolumn}[3]{%
  \def#3{}}%
```

Check data base exists

```
\DTLifdbexists{#1}%
{%
```

Check column exists

```
\@sDTLifhaskey{#1}{#2}%
{%
  \@sdtlforcolumn{\DTLthisval}{#1}{#2}%
  {%
    \ifdefempty{#3}%
    {%
      \let#3\DTLthisval
    }%
    {%
      \DTLmin{#3}{#3}{\DTLthisval}%
    }%
  }%
}%
```

key not defined for this data base

```
{%
  \PackageError{datatool}{Key ‘#2’ doesn’t
    exist in database ‘#1’}{}%
}%
```

data base doesn’t exist

```
{%
  \PackageError{datatool}{Data base ‘#1’ doesn’t
    exist}{}%
}%
}
```

`\DTLmaxforkeys` `\DTLmaxforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}`

Determines the maximum over all entries for each key in `<key list>` over all databases in `<db list>`, and stores in `<cmd>`, which must be a control sequence. The first optional argument `<condition>` is the same as that for `\DTLforeach`. The second optional argument is an assignment list to pass to `\DTLforeach` in the event that extra information is required in the condition.

```

\newcommand*\DTLmaxforkeys}[1][\boolean{true}]\and
\DTLisnumerical{\DTLthisval}] {%
\def\@dtl@cond{#1}%
\@dtlmaxforkeys
}

```

\@dtlmaxforkeys

```

\newcommand*\@dtlmaxforkeys}[4][ ] {%
\def#4{%

```

Iterate over all the listed data bases

```
\@for\@dtl@dbname:=#2\do{%
```

Iterate through this database (using read only version)

```

\@sDTLforeach{\@dtl@dbname}%
{#1}% assignment list
{%

```

Iterate through key list.

```

\@for\@dtl@key:=#3\do{%
\@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%
\dtlcurrentrow=\expandafter{\dtl@thisrow}%
\dtlgetentryfromrow{\DTLthisval}{\@dtl@col}{\dtlcurrentrow}%
\expandafter\ifthenelse\expandafter{\@dtl@cond}%
{%
\ifdefempty{#4}%
{%
\let#4\DTLthisval
}%
}%
\DTLmax{#4}{#4}{\DTLthisval}%
}%
}%
}%
}

```

\DTLmaxforcolumn \DTLmaxforcolumn{<db>}{<key>}{<cmd>}

Quicker version of \DTLmaxforkeys that just finds the maximum value in one column (specified by <key>) for a single database (specified by <db>) and stores the result in <cmd>.

```

\newcommand*\DTLmaxforcolumn}[3]{%
\def#3{%

```

Check data base exists

```

\DTLifdbexists{#1}%
{%

```

Check column exists

```
\@sDTLifhaskey{#1}{#2}%
{%
  \@sdtlforcolumn{\DTLthisval}{#1}{#2}%
  {%
    \ifdefempty{#3}%
    {%
      \let#3\DTLthisval
    }%
    {%
      \DTLmax{#3}{#3}{\DTLthisval}%
    }%
  }%
}%
```

key not defined for this data base

```
{%
  \PackageError{datatool}{Key ‘#2’ doesn’t
    exist in database ‘#1’}{}%
}%
```

data base doesn't exist

```
{%
  \PackageError{datatool}{Data base ‘#1’ doesn’t
    exist}{}%
}%
}
```

\DTLcomputebounds

```
\DTLcomputebounds[<condition>]{<db list>}{<x key>}{<y key>}{<minX cmd>}{<minY cmd>}{<maxX cmd>}{<maxY cmd>}
```

Computes the maximum and minimum x and y values over all the databases listed in $\langle db\ list \rangle$ where the x value is given by $\langle x\ key \rangle$ and the y value is given by $\langle y\ key \rangle$. The results are stored in $\langle minX\ cmd \rangle$, $\langle minY\ cmd \rangle$, $\langle maxX\ cmd \rangle$ and $\langle maxY\ cmd \rangle$ in standard decimal format.

```
\newcommand*\DTLcomputebounds[8][\boolean{true}]{%
  \let#5=\relax
  \let#6=\relax
  \let#7=\relax
  \let#8=\relax
  \@for\dtl@thisdb:=#2\do{%
    \@sDTLforeach[#1]{\dtl@thisdb}{\DTLthisX=#3,\DTLthisY=#4}{%
      \expandafter\DTLconverttodecimal\expandafter{\DTLthisX}{\dtl@decx}%
      \expandafter\DTLconverttodecimal\expandafter{\DTLthisY}{\dtl@decy}%
      \ifx#5\relax
        \let#5=\dtl@decx
        \let#6=\dtl@decy
```

```

        \let#7=\dtl@decx
        \let#8=\dtl@decy
    \else
        \dtlmin{#5}{#5}{\dtl@decx}%
        \dtlmin{#6}{#6}{\dtl@decy}%
        \dtlmax{#7}{#7}{\dtl@decx}%
        \dtlmax{#8}{#8}{\dtl@decy}%
    \fi
}%
}%
}

```

\DTLgetvalueforkey

```
\DTLgetvalueforkey{<cmd>}{<key>}{<db name>}{<ref key>}{<ref value>}
```

This (globally) sets *<cmd>* (a control sequence) to the value of the key specified by *<key>* in the first row of the database called *<db name>* which contains the key *<ref key>* which has the value *<value>*.

```
\newcommand*{\DTLgetvalueforkey}[5]{%
```

Get row containing referenced (key,value) pair

```
\DTLgetrowforkey{\@dtl@row}{#3}{#4}{#5}%
```

Get column number for *<key>*

```
\@sdtl@getcolumnindex{\@dtl@col}{#3}{#2}%
```

Get value for given column

```

{%
    \dtlcurrentrow=\expandafter{\@dtl@row}%
    \edef\@dtl@dogetval{\noexpand\dtlgetentryfromcurrentrow
        {\noexpand\@dtl@val}{\@dtl@col}}%
    \@dtl@dogetval
    \global\let#1=\@dtl@val
}%
}

```

\DTLgetrowforkey

```
\DTLgetrowforkey{<cmd>}{<db name>}{<ref key>}{<ref value>}
```

This (globally) sets *<cmd>* (a control sequence) to the first row of the database called *<db name>* which contains the key *<ref key>* that has the value *<value>*.

```

\newcommand*{\DTLgetrowforkey}[4]{%
    \global\let#1=\@empty
    \@sDTLforeach{#2}{\dtl@refvalue=#3}{%
        \DTLifnull{\dtl@refvalue}%
        {}%
        {%
            \ifthenelse{\equal{\dtl@refvalue}{#4}}{%
                {%

```



```

        \xdef#1{\the\dtlcurrentrow}%
        \dtlbreak
    }%
    {}%
} %
} %
}

```

4.10 Sorting Databases

`\@dtl@list` Token register to store data when sorting.

```
\newtoks\@dtl@list
```

`\DTLsort` `\DTLsort [<replacement keys>]{<sort criteria>}{<db name>}`

Sorts database *<db name>* according to *{<sort criteria>}*, which must be a comma separated list of keys, and optionally *=<order>*, where *<order>* is either ascending or descending. The optional argument is a list of keys to uses if the given key has a null value. The starred version uses a case insensitive string comparison.

```
\newcommand*{\DTLsort}{\@ifstar\@sDTLsort\@DTLsort}
```

`\@DTLsort` Unstarred (case sensitive) version.

```
\newcommand{\@DTLsort}[3][[]]{%
```

Check the database exists

```

\DTLifdbexists{#3}%
{%

```

Store replacement keys in `\@dtl@replacementkeys`.

```
\edef\@dtl@replacementkeys{#1}%
```

Store sort order in `\@dtl@sortorder`.

```
\edef\@dtl@sortorder{#2}%
```

Set `\@dtl@comparecs` to the required string comparison function. (Using case sensitive comparison macro `\dtlcompare`.)

```
\let\@dtl@comparecs=\dtlcompare
```

Sort the database.

```

\dtl@sortdata{#3}%
}%
{%
\PackageError{datatool}{Database ‘#3’ doesn’t exist}{}%
}%
}

```

`\@sDTLsort` Starred (case insensitive) version.

```

\newcommand{\@sDTLsort}[3][]{%
  Check the database exists
  \DTLifdbexists{#3}%
  {%
    Store replacement keys in \@dtl@replacementkeys.
    \edef\@dtl@replacementkeys{#1}%
    Store sort order in \@dtl@sortorder.
    \edef\@dtl@sortorder{#2}%
    Set \@dtl@comparecs to the required string comparison function. (Using case
    insensitive comparison macro \dtlcompare.)
    \let\@dtl@comparecs=\dtlcompare
    Sort the database.
    \dtl@sortdata{#3}%
  }%
  {%
    \PackageError{datatool}{Database ‘#3’ doesn’t exist}{}%
  }%
}
```

`\@dtl@rowa` Token register to store first row when sorting.

```

\newtoks\@dtl@rowa
```

`\@dtl@rowb` Token register to store comparison row when sorting.

```

\newtoks\@dtl@rowb
```

`\dtl@sortdata` `\dtl@sortdata{<db>}`

Sorts the data in named database using an insertion sort algorithm. `\@dtl@replacementkeys`, `\@dtl@sortorder` and `\@dtl@comparecs` must be set prior to use.

```

\newcommand*\dtl@sortdata[1]{%
  Initialise macro containing sorted data.
  \def\@dtl@sortedlist{}%
  Store database name.
  \edef\@dtl@dbname{#1}%
  Iterate through each row and insert into sorted list.
  \@dtlforeachrow(\@dtl@rowAnum,\@dtl@rowAcontents)\in{#1}\do{%
    \@dtl@rowa=\expandafter{\@dtl@rowAcontents}%
  }
  Create a temporary list
  \def\@dtl@newlist{}%
```

Initialise the insertion for this iteration. Insertion hasn't been done yet.

```
\@dtl@insertdonefalse
```

Initialise row index to 0

```
\dtlrownum=0\relax
```

Iterate through sorted list.

```
\expandafter\@dtl@foreachrow\@dtl@sortedlist
\@dtl@row@elt@w%
\@dtl@row@id@w \@nil\@dtl@row@id@end@%
\@dtl@row@id@w \@nil\@dtl@row@id@end@%
\@dtl@row@elt@end@%
\@@{\@dtl@rowBnum}{\@dtl@rowBcontents}{%
```

Store row B in a token register

```
\@dtl@rowb=\expandafter{\@dtl@rowBcontents}%
```

Get current row number of sorted list

```
\dtlrownum=\@dtl@rowBnum
```

Has the insertion been done?

```
\if@dtl@insertdone
```

New element has already been inserted, so just increment the row number to compensate for the inserted row.

```
\advance\dtlrownum by 1\relax
\else
```

Insertion hasn't been done yet. Compare row A and row B.

```
\@dtl@sortcriteria{\@dtl@rowa}{\@dtl@rowb}%
```

If \@dtl@sortresult is negative insert A before B.

```
\ifnum\dtl@sortresult<0\relax
```

Insert row A into new list. First store \@dtl@newlist in \toks@.

```
\toks@=\expandafter{\@dtl@newlist}%
```

Update \@dtl@newlist to be the old value followed by row A.

```
\edef\@dtl@newlist{%
```

Old value:

```
\the\toks@
```

Format row A

```
\noexpand\@dtl@row@elt@w%
\noexpand\@dtl@row@id@w \number\dtlrownum
\noexpand\@dtl@row@id@end@%
\the\@dtl@rowa
\noexpand\@dtl@row@id@w \number\dtlrownum
\noexpand\@dtl@row@id@end@%
\noexpand\@dtl@row@elt@end@%
}%
```

Increment row number to compensate for inserted row.

```
\advance\dtlrownum by 1\relax
```

Mark insertion done.

```
\@dtl@insertdonetrue
\fi
\fi
```

Insert row B

```
\toks@=\expandafter{\@dtl@newlist}%
\edef\@dtl@newlist{\the\toks@
```

row B

```
\noexpand\db@row@elt@w%
\noexpand\db@row@id@w \number\dtlrownum
\noexpand\db@row@id@end@%
\the\@dtl@rowb
\noexpand\db@row@id@w \number\dtlrownum
\noexpand\db@row@id@end@%
\noexpand\db@row@elt@end@%
}%
```

Repeat loop.

```
}\q@nil
```

If row A hasn't been inserted, do so now.

```
\if@dtl@insertdone
\else
```

\dtlrownum contains the index of the last row in new list, So increment it to get the new index for row A.

```
\advance\dtlrownum by 1\relax
```

Insert row A.

```
\toks@=\expandafter{\@dtl@newlist}%
\edef\@dtl@newlist{\the\toks@
```

row A

```
\noexpand\db@row@elt@w%
\noexpand\db@row@id@w \number\dtlrownum
\noexpand\db@row@id@end@%
\the\@dtl@rowa
\noexpand\db@row@id@w \number\dtlrownum
\noexpand\db@row@id@end@%
\noexpand\db@row@elt@end@%
}%
\fi
```

Set sorted list to new list.

```
\let\@dtl@sortedlist=\@dtl@newlist
}%
```

Update database.

```
\expandafter\global\csname dtldb@#1\endcsname=\expandafter
{\@dtl@sortedlist}%
}
```

```
\@dtl@sortcriteria \@dtl@sortcriteria{\<row a toks>}{\<row b toks>}
```

\@dtl@dbname and \@dtl@sortorder must be set before use \@dtl@sortorder is a comma separated list of either just keys or *<key>=<direction>*. (Check keys are valid before use.)

```
\newcommand{\@dtl@sortcriteria}[2]{%
```

Iterate through the sort order.

```
\@for\@dtl@level:=\@dtl@sortorder\do{%
```

Set \@dtl@sortdirection to -1 (ascending) or +1 (descending). Key is stored in \@dtl@key.

```
\expandafter\@dtl@getsortdirection\@dtl@level=\relax
```

Initially comparing on the same key

```
\let\@dtl@keya=\@dtl@key
```

```
\let\@dtl@keyb=\@dtl@key
```

Get values corresponding to key from both rows. First get column index corresponding to key.

```
\@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@key}%
```

Get entry for this column from row A and store in \@dtl@a.

```
\dtlgetentryfromrow{\@dtl@a}{\@dtl@col}{#1}%
```

Get entry for this column from row B and store in \@dtl@b.

```
\dtlgetentryfromrow{\@dtl@b}{\@dtl@col}{#2}%
```

Has value from row A been defined?

```
\ifx\@dtl@a\dtlnovalue
```

Value hasn't been defined so set to null

```
\@dtl@setnull{\@dtl@a}{\@dtl@key}%
```

```
\fi
```

Has value from row B been defined?

```
\ifx\@dtl@b\dtlnovalue
```

Value hasn't been defined so set to null

```
\@dtl@setnull{\@dtl@b}{\@dtl@key}%
```

```
\fi
```

Check if value for row A is null.

```
\DTLifnull{\@dtl@a}%
```

```
{%
```

Value for row A is null, so find the first non null key in list of replacement keys.

```
\@for\@dtl@keya:=\@dtl@replacementkeys\do{%
```

Get column corresponding to this key.

```
\@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@keya}%
```

```
\dtlgetentryfromrow{\@dtl@a}{\@dtl@col}{#1}%
```

Has value for row A been defined?

```
\ifx\@dtl@a\dtlnovalue
```

Value for row A hasn't been defined so set to null

```
\@dtl@setnull{\@dtl@a}{\@dtl@key}%  
\fi
```

Is value for row A null? If not null end the loop.

```
\DTLifnull{\@dtl@a}{\@endfortrue}%  
}%
```

No non-null value found.

```
\ifx\@dtl@keya\@nnil  
\let\@dtl@keya\@dtl@key  
\@dtl@setnull{\@dtl@a}{\@dtl@key}%  
\fi  
}%  
{}%
```

Check if value for row B is null.

```
\DTLifnull{\@dtl@b}%  
{%
```

Value for row B is null, so find the first non null key in list of replacement keys.

```
\@for\@dtl@keyb:=\@dtl@replacementkeys\do{%
```

Get column corresponding to this key.

```
\@sdtl@getcolumnindex{\@dtl@col}{\@dtl@dbname}{\@dtl@keyb}%  
\dtlgetentryfromrow{\@dtl@b}{\@dtl@col}{#2}%
```

Has value for row B been defined?

```
\ifx\@dtl@b\dtlnovalue
```

Value for row B hasn't been defined so set to null.

```
\@dtl@setnull{\@dtl@b}{\@dtl@key}%  
\fi
```

Is value for row B null? If not null end the loop.

```
\DTLifnull{\@dtl@b}{\@endfortrue}%  
}%
```

No non-null value found.

```
\ifx\@dtl@keyb\@nnil  
\let\@dtl@keyb\@dtl@key  
\@dtl@setnull{\@dtl@b}{\@dtl@key}%  
\fi  
}%  
{}%
```

Compare rows A and B. First store the values for row A and B in token registers so that they can be passed to \dtl@compare@.

```
\@dtl@toksA=\expandafter{\@dtl@a}%  
\@dtl@toksB=\expandafter{\@dtl@b}%
```

Do comparison.

```
\edef\@dtl@docompare{\noexpand\dtl@compare@
{\@dtl@keya}{\@dtl@keyb}}%
{\noexpand\@dtl@toksA}{\noexpand\@dtl@toksB}}}%
\@dtl@docompare
```

Repeat if the two values are considered identical and there are further sorting options.

```
\ifnum\dtl@sortresult=0\relax
```

Reset switch to prevent breaking out of outer loop.

```
\@endforfalse
\else
```

Break out of loop.

```
\@endfortrue
\fi
}%
```

Apply sort direction

```
\multiply\dtl@sortresult by -\@dtl@sortdirection\relax
}
```

`dtl@getsortdirection` Get the direction from either *<key>* or *<key>=<direction>*. Sets `\@dtl@sortdirection` to either -1 (ascending) or 1 (descending).

```
\def\@dtl@getsortdirection#1=#2\relax{%
```

Store key in `\@dtl@key`.

```
\def\@dtl@key{#1}%
```

Store sort direction. This will be empty if no direction was specified.

```
\def\@dtl@sortdirection{#2}%
```

Check if a direction was specified.

```
\ifdefempty{\@dtl@sortdirection}%
{%
```

No direction specified so assume ascending.

```
\def\@dtl@sortdirection{-1}%
}%
{%
```

Get the sort direction from the second argument (needs terminating equal sign removed) and store in `\@dtl@sortdirection`.

```
\@dtl@get@sortdirection#2%
```

Determine the direction.

```
\def\@dtl@dir{ascending}%
\ifx\@dtl@sortdirection\@dtl@dir
```

Ascending

```
\def\@dtl@sortdirection{-1}%
\else
```

Check if descending.

```
\def\@dtl@dir{descending}%  
\ifx\@dtl@sortdirection\@dtl@dir
```

Descending

```
\def\@dtl@sortdirection{1}%  
\else
```

Direction not valid. Generate error message.

```
\PackageError{datatool}{Invalid sort direction  
'\@dtl@sortdirection'}{The sort direction can only be  
one of 'ascending' or 'descending'}%
```

Assume ascending.

```
\def\@dtl@sortdirection{-1}  
\fi  
\fi  
}%  
}
```

1@get@sortdirection Get direction (trims trailing = sign)

```
\def\@dtl@get@sortdirection#1={\def\@dtl@sortdirection{#1}}
```

\@dtl@toksA

```
\newtoks\@dtl@toksA
```

\@dtl@toksB

```
\newtoks\@dtl@toksB  
% \end{macrocode}  
%\end{macro}  
%\begin{macro}{\dtl@compare}  
%\begin{definition}  
%\cs{dtl@compare}\marg{key}\marg{a toks}\marg{b toks}  
%\end{definition}  
% Compares two values according to \meta{key} of database given by  
% \cs{dtl@dbname}. Sets \cs{dtl@sortresult}. \cs{dtl@comparecs}  
% must be set to the required comparison macro.  
%\changes{2.0}{2009 February 27}{no longer used}  
% \begin{macrocode}  
\newcommand{\dtl@compare}[3]{%  
 \dtl@compare@{#1}{#1}{#2}{#3}%  
}
```

\dtl@compare@ \dtl@compare@{<keyA>}{<keyB>}{<A toks>}{<B toks>}

Compare <A> and according <keyA> and <keyB> for database given by \@dtl@dbname. Sets \dtl@sortresult. \@dtl@comparecs must be set before use.

```
\newcommand{\dtl@compare@}[4]{%
```


Get the data type for first key and store in \@dtl@typeA.

```
\DTLgetdatatype{\@dtl@typeA}{\@dtl@dbname}{#1}%
```

Is it unset? If so, assume string

```
\ifx\@dtl@typeA\DTLunsettype
\let\@dtl@typeA\DTLstringtype
\fi
```

Get the data type for the second key and store in \@dtl@typeB

```
\DTLgetdatatype{\@dtl@typeB}{\@dtl@dbname}{#2}%
```

Is it unset? If so, assume string

```
\ifx\@dtl@typeB\DTLunsettype
\let\@dtl@typeB\DTLstringtype
\fi
```

Multiply the two values together

```
\@dtl@tmpcount=\@dtl@typeA\relax
\multiply\@dtl@tmpcount by \@dtl@typeB\relax
```

If either type is 0 (a string) then the product will also be 0 (string) otherwise it will be one of the numerical types.

```
\ifnum\@dtl@tmpcount=0\relax
```

A string, so use comparison function

```
\edef\@dtl@tmpcmp{%
\noexpand\@dtl@comparecs{\noexpand\dtl@sortresult}%
{\the#3}{\the#4}%
}%
\@dtl@tmpcmp
\ifdtlverbose
\edef\@dtl@a{\the#3}%
\edef\@dtl@b{\the#4}%
\fi
\else
```

Store the first value

```
\edef\@dtl@a{\the#3}%
```

Store the second value

```
\edef\@dtl@b{\the#4}%
```

Compare

```
\DTLifnumlt{\@dtl@a}{\@dtl@b}%
{%
```

$A < B$

```
\dtl@sortresult=-1\relax
}%
{%
\DTLifnumgt{\@dtl@a}{\@dtl@b}%
{%
```

$A > B$

```
\dtl@sortresult=1\relax
}%
{%
```

$A = B$

```
\dtl@sortresult=0\relax
}%
}%
\fi
```

Write comparison result to terminal/log if verbose mode.

```
\ifdtlverbose
\@onelevel@sanitize\@dtl@a
\@onelevel@sanitize\@dtl@b
\dtl@message{'\@dtl@a' <=> '\@dtl@b' = \number\dtl@sortresult}%
\fi
}
```

4.11 Saving a database to an external file

\@dtl@write

\newwrite\@dtl@write

\DTLsavedb \DTLsavedb{\<db name>}{\<filename>}

Save a database as an ASCII data file using the separator and delimiter given by \@dtl@separator and \@dtl@delimiter.

```
\newcommand*{\DTLsavedb}[2]{%
\DTLifdbexists{#1}%
{%
```

Open output file

```
\openout\@dtl@write=#2\relax
```

Initialise header row

```
\def\@dtl@header{}%
```

Construct the header row

```
\dtlforeachkey(\@dtl@key,\@dtl@col,\@dtl@type,\@dtl@head)%
\in{#1}\do
{%
\IfSubStringInString{\@dtl@separator}{\@dtl@key}%
{%
\ifdefempty{\@dtl@header}%
{%
\protected@edef\@dtl@header{%
\@dtl@delimiter\@dtl@key\@dtl@delimiter}%
```

```

    }%
    {%
        \toks@=\expandafter{\@dtl@header}%
        \protected@edef\@dtl@header{%
            \the\toks@\@dtl@separator
            \@dtl@delimiter\@dtl@key\@dtl@delimiter}%
        }%
    }%
    {%
        \ifdefempty{\@dtl@header}%
        {%
            \protected@edef\@dtl@header{\@dtl@key}%
        }%
        {%
            \toks@=\expandafter{\@dtl@header}%
            \protected@edef\@dtl@header{\the\toks@
                \@dtl@separator\@dtl@key}%
        }%
    }%
}%

Print header
    \protected@write\@dtl@write{}\{\@dtl@header}%

Iterate through each row
    \@sDTLforeach{#1}{}%
    {%

Initialise row
        \def\@dtl@row{}%

Iterate through each key
        \DTLforeachkeyinrow{\@dtl@val}%
        {%
            \IfSubStringInString{\@dtl@separator}{\@dtl@val}%
            {%
                \ifdefempty{\@dtl@row}%
                {%
                    \protected@edef\@dtl@row{%
                        \@dtl@delimiter\@dtl@val\@dtl@delimiter}%
                }%
                {%
                    \toks@=\expandafter{\@dtl@row}%
                    \protected@edef\@dtl@row{\the\toks@\@dtl@separator
                        \@dtl@delimiter\@dtl@val\@dtl@delimiter}%
                }%
            }%
        }%
        {%
            \ifdefempty{\@dtl@row}%
            {%
                \protected@edef\@dtl@row{\@dtl@val}%
            }%
        }%
    }%

```

```

    }%
    {%
        \toks@=\expandafter{\@dtl@row}%
        \protected@edef\@dtl@row{\the\toks@\@dtl@separator
            \@dtl@val}%
    }%
}%
}%
}%

```

Print row

```

    \protected@write\@dtl@write{\@dtl@row}%
}%

```

Close output file

```

    \closeout\@dtl@write
}%
{%
    \PackageError{datatool}{Can't save database '#1': no such
        database}{}%
}%
}

```

`\DTLsavetexdb` `\DTLsavetexdb{<db name>}{<filename>}`

Save a database as a \LaTeX file.

```

\newcommand*{\DTLsavetexdb}[2]{%
    \DTLifdbexists{#1}%
    {%

```

Open output file

```

        \openout\@dtl@write=#2\relax

```

Write new data base definition

```

        \protected@write\@dtl@write{\string\DTLnewdb{#1}}%

```

Iterate through each row

```

        \@sDTLforeach{#1}{%
            {%

```

Start new row

```

                \protected@write\@dtl@write{\string\DTLnewrow*{#1}}%

```

Iterate through each column

```

                \DTLforeachkeyinrow{\@dtl@val}%
                {%

```

Is this entry null?

```

                    \DTLifnull{\@dtl@val}%
                    {\def\@dtl@val{}}%
                }%
            }%
        }%
    }%
}

```

Add entry

```
\protected@write\@dtl@write{}{%
  \string\DTLnewdbentry*{#1}{\dtlkey}{\@dtl@val}}%
}%
}%
```

Save the column headers.

```
\dtlforeachkey(\@dtl@k,\@dtl@c,\@dtl@t,\@dtl@h)\in{#1}\do
{%
  \@onelevel@sanitize\@dtl@h
  \protected@write\@dtl@write{}{%
    \string\DTLsetheader*{#1}{\@dtl@k}{\@dtl@h}}%
}%
```

Close output file

```
\closeout\@dtl@write
}%
{%
  \PackageError{datatool}{Can't save database '#1': no such
    database}{}%
}%
}
```

4.12 Loading a database from an external file

`\@dtl@read`

```
\newread\@dtl@read
```

`\dtl@entrycr` Keep track of current column in data file

```
\newcount\dtl@entrycr
```

`\ifdtlnoheader` The noheader option indicates that the file doesn't have a header row.

```
\define@boolkey{loaddb}[dtl]{noheader}[true]{}
```

The keys option specifies the list of keys in the same order as the columns in the data file. Each key is stored in `\@dtl@inky@<n>` where `<n>` is the roman numeral representation of the current column.

```
\define@key{loaddb}{keys}{%
  \dtl@entrycr=0\relax
  \@for\@dtl@key:=#1\do
  {%
    \advance\dtl@entrycr by 1\relax
    \expandafter
      \edef\csname @dtl@inky@\romannumeral\dtl@entrycr\endcsname{%
        \@dtl@key}%
  }%
}
```

The `headers` option specifies the list of headers in the same order as the columns in the data file.

```
\define@key{loaddb}{headers}{%
  \dtl@entrycr=0\relax
  \@for\@dtl@head:=#1\do
  {%
    \advance\dtl@entrycr by 1\relax
    \toks@=\expandafter{\@dtl@head}%
    \expandafter
      \edef\csname @dtl@inhd@\romannumeral\dtl@entrycr\endcsname{%
        \the\toks@}%
    }%
  }
```

The following is supplied in a patch by Bruno Le Floch:

```
\newcount{\dtl@omitlines}
\define@key{loaddb}{omitlines}{\dtl@omitlines=#1\relax}
```

`\dtldefaultkey` Default key to use if none specified (column index will be appended).

```
\newcommand*{\dtldefaultkey}{Column}
```

`\@dtl@readline` `\@dtl@readline{<file reg>}{<cs>}`

Reads line from `<file reg>`, trims end of line character and stores in `<cs>`.

```
\newcommand*{\@dtl@readline}[2]{%
% Read a line from "#1" and store in "#2"
%   \begin{macrocode}
  \read#1 to #2%
%   \end{macrocode}
```

Trim the end of line character

```
\ifdefempty{#2}%
{%
}%
{%
  \dtl@trim#2%
}
}
```

`\@dtl@readrawline` `\@dtl@readrawline{<file register>}{<cs>}`

Reads line from `<file register>`, trims end of line character, applies mappings and stores in `<cs>`.

```
\newcommand*{\@dtl@readrawline}[2]{%
% Read a line from "#1" and store in "#2"
%   \begin{macrocode}
  \@dtl@rawread#1 to #2%
%   \end{macrocode}
```

Trim the end of line character

```
\dtl@trim#2%
```

Apply mappings

```
\dtl@domappings\@dtl@line  
}
```

\DTLloaddb `\DTLloaddb[<options>]{<db name>}{<filename>}`

Creates a new database called *<db name>*, and loads the data in *<filename>* into it. The separator and delimiter used in the file must match \@dtl@separator and \@dtl@delimiter. The optional argument is a comma-separated list.

```
\newcommand*{\DTLloaddb}{%  
  \let\@dtl@doreadline\@dtl@readline  
  \@dtlloaddb  
}
```

\@dtlloaddb Loads database using \@dtl@doreadline to read and trim line from file. (*&@dtl@doreadline* must be set before use.)

```
\newcommand*{\@dtlloaddb}[3][]{%
```

Check if file exists

```
\IfFileExists{#3}{%
```

File exists. Locally change catcode of double quote character in case it has been made active.

```
\begingroup  
  \catcode'\ "12\relax
```

Initialise default options

```
\dtlnoheaderfalse
```

Get the options

```
\setkeys{loaddb}{#1}%
```

Open the file for reading.

```
\openin\@dtl@read=#3%  
\dtl@message{Reading '#3'}%
```

The following supplied in patch by Bruno Le Floch:

```
\loop  
\ifnum \dtl@omitlines > \z@  
  \advance\dtl@omitlines by \m@ne  
  \read\@dtl@read to \@dtl@line  
\repeat
```

Create the new database.

```
\DTLnewdb{#2}%
```

Check if the file is empty.

```
\ifeof\@dtl@read
```

File is empty, so just issue a warning.

```
\PackageWarning{datatool}{File ‘#3’ has no data}%  
\else
```

Does the file have a header row?

```
\ifdtlnoheader  
\else
```

Remove initial blank rows

```
\loop
```

Set repeat condition to false

```
\@dtl@conditionfalse
```

Do nothing if reached the end of file

```
\ifeof\@dtl@read  
\else
```

Read a line from the file and store in \@dtl@line

```
\@dtl@doreadline\@dtl@read\@dtl@line
```

If this is a blank row, set repeat condition to true

```
\ifdefempty{\@dtl@line}%  
{%  
  \@dtl@conditiontrue  
}%  
{%  
}%  
\fi
```

Repeat loop if necessary

```
\if@dtl@condition  
\repeat
```

Parse the header row. Store the row as $\langle sep \rangle \langle row \rangle \langle sep \rangle$ in \@dtl@lin@.

```
\protected@edef\@dtl@lin@{%  
  \@dtl@separator\@dtl@line\@dtl@separator}%
```

Keep track of columns:

```
\dtl@entrycr=0\relax
```

Keep lopping off elements until the end of the row is reached. (That is, until \@dtl@lin@ is \@dtl@separator.)

```
\loop
```

Lopoff the first element and store in \@dtl@key

```
\expandafter\@dtl@lopoff\@dtl@lin@\to\@dtl@lin@\@dtl@key
```

Increment column count.

```
\advance\dtl@entrycr by 1\relax
```

If missing a key, add generic one:

```
\ifdefempty{\@dtl@key}%  
{%
```



```

\edef\@dtl@key{\dtldefaultkey\number\dtl@entrycr}%
}%
{}%

```

Store key in \@dtl@toks

```

\expandafter\@dtl@toks\expandafter{\@dtl@key}%

```

Store the key in \@dtl@inky@<n> where <n> is the roman numeral representation of the current column, unless already defined.

```

\@ifundefined{\@dtl@inky@\romannumeral\dtl@entrycr}%
{%
\expandafter
\edef\csname @dtl@inky@\romannumeral
\dtl@entrycr\endcsname{\the\@dtl@toks}%
}%
{}%

```

If key has been specified in #1, then use the header found in the file, unless a header has also been specified in #1

```

\@ifundefined{\@dtl@inhd@\romannumeral\dtl@entrycr}%
{%
\expandafter
\edef\csname @dtl@inhd@\romannumeral
\dtl@entrycr\endcsname{\the\@dtl@toks}%
}%
{}%
}%

```

Check if the loop should be repeated

```

\ifx\@dtl@lin@\@dtl@separator
\@dtl@conditionfalse
\else
\@dtl@conditiontrue
\fi

```

Repeat loop if necessary.

```

\if@dtl@condition
\repeat

```

End if no header

```

\fi

```

Now for the rest of the data. If the end of file has been reached, then only the header row is available or file is empty.

```

\ifeof\@dtl@read
\ifdtlnoheader
\PackageWarning{datatool}{No data in '#3'}%
\else
\PackageWarning{datatool}{Only header row found in '#3'}%
\fi
\else

```

Iterate through the rest of the file. First set the repeat condition to true:

```
\@dtl@conditiontrue
\loop
```

Read in a line

```
\@dtl@doreadline\@dtl@read\@dtl@line
```

Check if the line is empty.

```
\ifdefempty{\@dtl@line}%
{%
```

Do nothing if the row is empty.

```
}%
{%
```

Add a new row to the database. (Don't need to check if the database exists, since it's just been created.)

```
\@sDTLnewrow{#2}%
```

Store the row as *<sep><row><sep>* to make the lopping off easier

```
\expandafter\@dtl@toks\expandafter{\@dtl@line}%
\edef\@dtl@lin@{\@dtl@separator\the\@dtl@toks
\@dtl@separator}%
```

Reset the column counter.

```
\dtl@entrycr=0\relax
```

Iterate through each element in the row. Needs to be grouped since we're already inside a loop.

```
{%
```

Initialise repeat condition

```
\@dtl@conditiontrue
```

Iterate through the list

```
\loop
```

lop off first element and store in \@dtl@thisentry

```
\expandafter\@dtl@lopoff\@dtl@lin@\to
\@dtl@lin@\@dtl@thisentry
```

Increment the column count.

```
\advance\dtl@entrycr by 1\relax
```

Get the key for this column and store in \@dtl@thiskey. Use default value if not defined.

```
\@ifundefined{\@dtl@inky@\romannumeral\dtl@entrycr}%
{%
\edef\@dtl@thiskey{\dtldefaultkey
\number\dtl@entrycr}%
\expandafter\let
\csname @dtl@inky@\romannumeral
\dtl@entrycr\endcsname\@dtl@thiskey
```

```

    }%
    {%
        \edef\@dtl@thiskey{%
            \csname @dtl@inky@\romannumeral
                \dtl@entrycr\endcsname}%
        }%
Store this entry in \@dtl@toks
    \expandafter\@dtl@toks\expandafter{\@dtl@thisentry}%
Add this entry to the database
    \edef\@do@dtlnewentry{\noexpand\@sDTLnewdbentry
        {#2}{\@dtl@thiskey}{\the\@dtl@toks}}%
    \@do@dtlnewentry
Check if loop should be terminated
    \ifx\@dtl@lin@\@dtl@separator
        \@dtl@conditionfalse
    \fi
Repeat loop if necessary
    \if@dtl@condition
        \repeat
    }%
End of parsing this row
    }%
If the end of file has been reached, set the repeat condition to false.
    \ifeof\@dtl@read \@dtl@conditionfalse\fi
Repeat if necessary
    \if@dtl@condition
        \repeat
    \fi
End of first \ifeof
    \fi
Close the input file
    \closein\@dtl@read
Set the headers if required
    \edef\@dtl@maxcols{\expandafter
        \number\csname dtlcols@#2\endcsname}%
    \dtl@forint\dtl@entrycr=1\to\@dtl@maxcols\step1\do
    {%
        \ifundefined{\@dtl@inhd@\romannumeral\dtl@entrycr}%
        {}%
        {%
            \expandafter\let\expandafter\@dtl@head
                \csname @dtl@inhd@\romannumeral\dtl@entrycr\endcsname
            \@dtl@toks=\expandafter{\@dtl@head}%

```

```

\edef\@dtl@dosetheader{\noexpand\@dtl@setheaderforindex
  {#2}{\number\dtl@entrycr}{\the\@dtl@toks}}%
\@dtl@dosetheader
}%
}%
End current scope
\endgroup
End true part of if file exists
}{%
Requested file not found on TeX's path
\PackageError{datatool}{Can't load database '#2' (file '#3'
doesn't exist)}{}%
}%
}

```

\dtl@trim \dtl@trim{<line>}

Trims the trailing space from <line>.

```

\newcommand{\dtl@trim}[1]{%
  \def\@dtl@trmstr{}%
  \expandafter\@dtl@startttrim#1\@nil
  \let#1=\@dtl@trmstr
}

```

\@dtl@startttrim Start trimming

```

\long\def\@dtl@startttrim#1#2{%
  \def\@dtl@tmpB{#2}%
  \ifx\par#1%
    \def\@dtl@dotrim{\@dtl@trim{} #2}%
  \else
    \ifx\@dtl@tmpB\@nnil
      \def\@dtl@dotrim{}%
      \def\@dtl@trmstr{#1}%
    \else
      \def\@dtl@dotrim{\@dtl@trim#1#2}%
    \fi
  \fi
  \@dtl@dotrim
}

```

\@dtl@trim

```

\long\def\@dtl@trim#1 \@nil{\long\def\@dtl@trmstr{#1}}

```

\DTLloadrawdb \DTLloadrawdb{<db name>}{<filename>}

Loads a raw database (substitutes % → \%, \$ → \\$, & → \&, # → \#, ~ → \textasciitilde, _ → _ and ^ → \textasciicircum.) The user can add additional mappings.

```
\newcommand*{\DTLloadrawdb{%
  \let\@dtl@doreadline\@dtl@readrawline
  \@dtlloaddb
}
```

\@dtl@rawread \@dtl@rawread<number>to<cmd>

Reads in a raw line from file given by <number> converts special characters and stores in <cmd>

```
\begingroup
\catcode'\%=\active
\catcode'\$=\active
\catcode'\&=\active
\catcode'\~= \active
\catcode'\_=\active
\catcode'\^=\active
\catcode'\#=\active
\catcode'\?=\relax
\catcode'\<=\relax
\catcode'\>=\relax
\catcode'\{=\active
\catcode'\}=\active
\gdef\@dtl@rawread?1to?2<\relax
<<\catcode'\%=\active
\catcode'\$=\active
\catcode'\&=\active
\catcode'\~= \active
\catcode'\_=\active
\catcode'\^=\active
\catcode'\#=\active
\catcode'\{=\active
\catcode'\}=\active
\def%<\noexpand\%>\relax
\def$<\noexpand\$>\relax
\def&<\noexpand\&>\relax
\def#<\noexpand\#>\relax
\def~<\noexpand\textasciitilde>\relax
\def_<\noexpand\_>\relax
\def^<\noexpand\textasciicircum>\relax
\@dtl@activatebraces
\@dtl@doreadraw?1?2>>>
\gdef\@dtl@doreadraw?1?2<\relax
\read?1 to \tmp
\xdef?2<\tmp>\relax
```

```
>
\endgroup
```

`@dtl@activatebraces` \@dtl@activatebraces resets braces for \@dtl@rawread

```
\begingroup
\catcode'\{=\active
\catcode'\}=\active
\catcode'\<=1\relax
\catcode'\>=2\relax
\gdef\@dtl@activatebraces<%
\catcode'\{=\active
\catcode'\}=\active
\def\<\noexpand\{>%
\def\>\noexpand\}>%
>%
\endgroup
```

`\DTLrawmap` `\DTLrawmap{<string>}{<replacement>}`

Additional mappings to perform when reading a raw data file

```
\newcommand*\@DTLrawmap[2]{%
\expandafter\@dtl@toks\expandafter{\@dtl@rawmappings}%
\ifdefempty{\@dtl@rawmappings}%
{
\def\@dtl@rawmappings{#{1}#{2}}%
}%
{
\def\@dtl@tmp{#{1}#{2}}
\protected@edef\@dtl@rawmappings{\the\@dtl@toks,\@dtl@tmp}
}%
}
```

`\@dtl@rawmappings` List of mappings.

```
\newcommand*\@dtl@rawmappings{}
```

`\dtl@domappings` `\dtl@domappings{<cmd>}`

Do all mappings in string given by `<cmd>`.

```
\newcommand*\@dtl@domappings[1]{%
\@for\@dtl@map:=\@dtl@rawmappings\do{%
\expandafter\DTLsubstituteall\expandafter#1\@dtl@map
}%
}
```

4.13 Debugging commands

These commands are provided to assist debugging

`\dtlshowdb` `\dtlshowdb{<db name>}`

Shows the database.

```
\newcommand*{\dtlshowdb}[1]{%
  \expandafter\showthe\csname dtldb@#1\endcsname
}
```

`\dtlshowdbkeys` `\dtlshowdbkeys{<db name>}`

Shows the key list for the named database.

```
\newcommand*{\dtlshowdbkeys}[1]{%
  \expandafter\showthe\csname dtlkeys@#1\endcsname
}
```

`\dtlshowtype` `\dtlshowtype{<db name>}{<key>}`

Show the data type for given key in the named database. This should be an integer from 0 to 3.

```
\newcommand*{\dtlshowtype}[2]{%
  \DTLgetdatatype{\@dtl@type}{#1}{#2}\show\@dtl@type
}
```

5 databib.sty

5.1 Package Declaration

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{databib}[2012/07/18 v2.10 (NLCT)]
```

Load required packages:

```
\RequirePackage{datatool}
```

5.2 Package Options

`\dtlbib@style` The default bib style is stored in `\dtlbib@style`.

```
\newcommand*{\dtlbib@style}{plain}
```

The `style=databib` package option sets `\dtlbib@style`.

```
\define@choicekey{databib.sty}{style}{plain,abbrv,alpha}{%
\def\dtlbib@style{#1}}
```

Process package options:

```
\ProcessOptionsX
```

5.3 Loading BBL file

`\DTLloadbbl` `\DTLloadbib[<bbl file>]{<db name>}{<bib list>}`

```
\newcommand*{\DTLloadbbl}[3][\jobname.bbl]{%
\bibliographystyle{databib}%
\if@files
\immediate\write\@auxout{\string\bibdata{#3}}%
\fi
\DTLnewdb{#2}%
\edef\DTLBIBdbname{#2}%
\@input@{#1}}
```

`\DTLnewbibrow` `\DTLnewbibrow` adds a new row to the bibliography database. (`\DTLBIBdbname` must be set prior to use to the name of the datatool database which must exist. Any check to determine its existence should be performed when `\DTLBIBdbname` is set.)

```
\newcommand*{\DTLnewbibrow}{\@DTLnewrow{\DTLBIBdbname}}
```


<code>\DTLnewbibitem</code>	<code>\DTLnewbibitem{<key>}{<value>}</code>
-----------------------------	---

Adds a new database entry with the given key and value.

```
\newcommand*{\DTLnewbibitem}[2]{%
  \@DTLnewdbentry{\DTLBIBdbname}{#1}{#2}}
```

5.4 Predefined text

<code>\andname</code>	<code>\providecommand*{\andname}{and}</code>
<code>\ofname</code>	<code>\providecommand*{\ofname}{of}</code>
<code>\inname</code>	<code>\providecommand*{\inname}{in}</code>
<code>\etalname</code>	<code>\providecommand*{\etalname}{et al.}</code>
<code>\editorname</code>	<code>\providecommand*{\editorname}{editor}</code>
<code>\editorsname</code>	<code>\providecommand*{\editorsname}{editors}</code>
<code>\volumename</code>	<code>\providecommand*{\volumename}{volume}</code>
<code>\numbername</code>	<code>\providecommand*{\numbername}{number}</code>
<code>\pagesname</code>	<code>\providecommand*{\pagesname}{pages}</code>
<code>\pagename</code>	<code>\providecommand*{\pagename}{page}</code>
<code>\editionname</code>	<code>\providecommand*{\editionname}{edition}</code>
<code>\techreportname</code>	<code>\providecommand*{\techreportname}{Technical report}</code>
<code>\mscthesisname</code>	<code>\providecommand*{\mscthesisname}{Master's thesis}</code>
<code>\phdthesisname</code>	<code>\providecommand*{\phdthesisname}{PhD thesis}</code>

5.5 Displaying the bibliography

`\DTLbibliography{<bib dbname>}`

Displays the bibliography for the database *<bib dbname>* which must have previously been loaded using `\DTLloadbbl`.

`\DTLbibliography`

```
\newcommand*{\DTLbibliography}[2][\boolean{true}]{%
  \begin{DTLthebibliography}[#1]{#2}%
    \DTLforeachbibentry[#1]{#2}{%
      \DTLbibitem \DTLformatbibentry \DTLendbibitem
    }%
  \end{DTLthebibliography}%
}
```

`\DTLformatbibentry`

`\DTLformatbibentry`

Formats the current bib entry.

```
\newcommand*{\DTLformatbibentry}{%
```

Check format for this type is defined.

```
\@ifundefined{DTLformat\DBIBentrytype}%
{%
  \PackageError{datbib}{Don't know how to format bibliography
    entries of type '\DBIBentrytype'}{%
  }%
}
```

Print information to terminal and log file if in verbose mode.

```
\dtl@message{[\DBIBCitekey]}%
```

Initialise

```
\DTLstartsentencefalse\DTLmidsentencefalse\DTLperiodfalse
```

Format this entry

```
\csname DTLformat\DBIBentrytype\endcsname
}%
}
```

`\DTLendbibitem` Hook to add extra information at the end of a bibliography item. This does nothing by default.

```
\newcommand*{\DTLendbibitem}{}
```

`\DTLwidest` Define a length to store the widest bib entry label

```
\newlength\dtl@widest
```

computewidestbibentry

```
\DTLcomputewidestbibentry{<condition>}{<db name>}{<bib
label>}{<cmd>}
```

Computes the widest bibliography entry over all entries satisfying *<condition>* for the database called *<db name>*, where the bibliography label is formatted according to *<bib label>* and stores the result in *<cmd>* which must be a command name.

```
\newcommand*\DTLcomputewidestbibentry}[4]{%
\dtl@widest=0pt\relax
\let#4=\@empty
\DTLforeachbibentry[#1]{#2}{%
\settowidth{\dtl@tmplength}{#3}%
\ifdim\dtl@tmplength>\dtl@widest\relax
\dtl@widest=\dtl@tmplength
\protected@edef#4{#3}%
\fi
}%
}
```

\DTLforeachbibentry

```
\DTLforeachbibentry[<condition>]{<db name>}{<text>}
```

```
\DTLforeachbibentry*[<condition>]{<db name>}{<text>}
```

Iterates through the database called *<db name>* and does *<text>* if *<condition>* is met. As with `\DTLforeach`, the starred version is read only.

```
\newcommand*\DTLforeachbibentry{%
\@ifstar\@DTLforeachbibentry\@DTLforeachbibentry}
```

\@DTLforeachbibentry

Unstarred version

```
\newcommand*\@DTLforeachbibentry}[3][\boolean{true}]{%
```

Store database name.

```
\edef\DBIBname{#2}%
```

Reset row counter.

```
\setcounter{DTLbibrow}{0}%
```

Iterate through the database.

```
\@DTLforeach{#2}{\DBIBcitekey=CiteKey,\DBIBentrytype=EntryType}%
{%
\dtl@gathervalues{#2}{\dtlcurrentrow}%
\ifthenelse{#1}{\refstepcounter{DTLbibrow}{#3}}{%
}%
}
```

\sDTLforeachbibentry

Starred version

```
\newcommand*\@sDTLforeachbibentry}[3][\boolean{true}]{%
```

Store database name.

```
\edef\DBIBname{#2}%
```

Reset row counter.

```
\setcounter{DTLbibrow}{0}%
```

Iterate through the database (read only).

```
\@sDTLforeach{#2}{\DBIBCitekey=CiteKey,\DBIBentrytype=EntryType}%
{%
  \dtl@gathervalue{#2}{\dtlcurrentrow}%
  \ifthenelse{#1}{\refstepcounter{DTLbibrow}{#3}}{}%
}%
}
```

DTLbibrow The counter DTLbibrow keeps track of the current row in the body of \DTLforeachbibentry. (You can't rely on DTLrowi, DTLrowii and DTLrowiii, as \DTLforeachbibentry pass the conditions to the optional argument of \DTLforeach, but instead uses \ifthenelse, which means that DTLrowi etc will be incremented, even when the given condition is not met.)

```
\newcounter{DTLbibrow}
```

\theHDTLbibrow Keep hyperref happy:

```
\def\theHDTLbibrow{\theHDTLrow.bib.\arabic{DTLbibrow}}%
```

\DTLbibfield `\DTLbibfield{<field name>}`

Gets the value assigned to the field *<field name>* for the current row of \DTLforeachbibentry. (Doesn't check if the field exists, or if it is being used within \DTLforeachbibentry.)

```
\newcommand*{\DTLbibfield}[1]{\csname @dtl@key@#1\endcsname}
```

\DTLifbibfieldexists `\DTLifbibfieldexists{<field name>}{<true part>}{<>false part>}`

Determines whether the given field name exists for the current row of \DTLforeachbibentry.

```
\newcommand*{\DTLifbibfieldexists}[3]{%
  \@ifundefined{@dtl@key@#1}{#3}{%
    \expandafter\DTLifnull\csname @dtl@key@#1\endcsname
    {#3}{#2}}}
```

\DTLifanybibfieldexists `\DTLifanybibfieldexists{<list of field name>}{<true part>}{<>false part>}`

Determines whether any of the listed fields exist for the current row of \DTLforeachbibentry.

```
\newcommand*{\DTLifanybibfieldexists}[3]{%
  \@for\dtl@thisfield:=#1\do{%
    \@ifundefined{@dtl@key@\dtl@thisfield}{#3}{%
      \expandafter\DTLifnull\csname @dtl@key@\dtl@thisfield\endcsname
      {#3}{#2}}}
```

```

\expandafter\DTLifnull\csname @dtl@key@\dtl@thisfield\endcsname
}{\%
\@endfortrue}}}%
\if@endfor
#2%
\else
#3%
\fi
\@endforfalse
}

```

`\ifDTLperiod` The conditional `\ifDTLperiod` is used to keep track of any abbreviations ending with a period, this is to ensure that abbreviations aren't followed by a full stop if they already have a full stop terminating the abbreviation.

`\newif\ifDTLperiod`

<code>\DTLcheckendsperiod</code>	<code>\DTLcheckendperiod{<string>}</code>
----------------------------------	---

Checks if `<string>` ends with a full stop. This sets `\ifDTLperiod`.

```

\newcommand*{\DTLcheckendsperiod}[1]{%
\dtl@checkendsperiod#1\@nil\relax}

\def\dtl@checkendsperiod#1#2{%
\def\@dtl@argi{#1}\def\@dtl@argii{#2}%
\def\@dtl@period{.}%
\ifx\@dtl@argi\@nnil
\global\DTLperiodfalse
\let\@dtl@donext=\relax
\else
\ifx\@dtl@argii\@nnil
\ifx\@dtl@argi\@dtl@period
\global\DTLperiodtrue
\else
\global\DTLperiodfalse
\fi
\let\@dtl@donext=\@gobble
\else
\let\@dtl@donext=\dtl@checkendsperiod
\fi
\fi
\@dtl@donext{#2}%
}

```

<code>\ckbibfieldendsperiod</code>	<code>\DTLcheckbibfieldendperiod{<label>}</code>
------------------------------------	--

Checks if the bib field `<label>` ends with a full stop. This sets `\ifDTLperiod`.

```
\newcommand*{\DTLcheckbibfielddendsperiod}[1]{%
\protected@edef\@dtl@tmp{\DTLbibfield{#1}}%
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}}
```

`\ifDTLmidsentence` `\ifDTLmidsentence`

Determine whether we are in the middle of a sentence.

```
\newif\ifDTLmidsentence
```

`\ifDTLstartsentence` `\ifDTLstartsentence`

Determine whether we are at the start of a sentence.

```
\newif\ifDTLstartsentence
```

`\DTLaddperiod` `\DTLaddperiod`

Adds a full stop and sets `\DTLmidsentencefalse`, `\DTLstartsentencetrue` and `\DTLperiodfalse`.

```
\newcommand*{\DTLaddperiod}{\DTLmidsentencefalse\DTLperiodfalse
\DTLstartsentencetrue
\ifDTLperiod\else.\fi}
```

`\DTLaddcomma` `\DTLaddcomma`

Adds a comma and sets `\DTLmidsentencetrue`, `\DTLperiodfalse` and `\DTLstartsentencefalse`

```
\newcommand*{\DTLaddcomma}{, \DTLmidsentencetrue
\DTLperiodfalse\DTLstartsentencefalse}
```

`\DTLstartsencespace` Adds a space if at the start of the sentence, otherwise does nothing. (The space between sentences is added this way, rather than in `\DTLaddperiod` otherwise spurious extra space can occur at the end of the bib item. The `spacefactor` needs to be set manually, because there's stuff in the way of the previous sentence's full stop and this space which confuses the inter sentence spacing (and, of course, the previous sentence could have ended with a capital letter.)

```
\newcommand*{\DTLstartsencespace}{%
\ifDTLstartsentence\spacefactor=\sfcode'\.\relax\space
\fi\DTLstartsentencefalse}
```

`\DTLtwoand` In a list of only two author (or editor) names, the text between the two names is given by `\DTLtwoand`:

```
\newcommand*{\DTLtwoand}{\ \andname\ }
```

`\DTLandlast` In a list of author (or editor) names, the text between the penultimate and last name is given by `\DTLandlast`:

```
\newcommand*{\DTLandlast}{, \andname\ }
```

`\DTLandnotlast` In a list of author (or editor) names, the text between the names (except the penultimate and last name) is given by `\DTLandnotlast`:

```
\newcommand*{\DTLandnotlast}{, }
```

`\dtl@authorcount` Define a count register to keep track of the number of authors:

```
\newcount\@dtl@authorcount
```

`DTLmaxauthors` The counter `DTLmaxauthors` indicates the maximum number of author names to display, if there are more than that number, `\etalname` is used.

```
\newcounter{DTLmaxauthors}
\setcounter{DTLmaxauthors}{10}
```

`DTLformatauthorlist` Format a list of author names (the list is stored in `\@dtl@key@Author`):

```
\newcommand*{\DTLformatauthorlist}{%
\DTLifbibfieldexists{Author}{%
\DTLstartsencespace
\@dtl@authorcount=0\relax
\@for\@dtl@author:=\@dtl@key@Author\do{%
\advance\@dtl@authorcount by 1\relax}%
\@dtl@tmpcount=0\relax
\ifnum\@dtl@authorcount>\c@DTLmaxauthors
{%
\@for\@dtl@author:=\@dtl@key@Author\do{%
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount=1\relax
\expandafter\DTLformatauthor\@dtl@author
\else
\ifnum\@dtl@tmpcount>\c@DTLmaxauthors
\DTLandnotlast \etalname
\expandafter\DTLcheckendsperiod\expandafter{\etalname}%
\@endfortrue
\else
\DTLandnotlast \expandafter\DTLformatauthor\@dtl@author
\fi
\fi
}%
}%
\else
\@for\@dtl@author:=\@dtl@key@Author\do{%
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount=1\relax
\expandafter\DTLformatauthor\@dtl@author
\else
\ifnum\@dtl@tmpcount=\@dtl@authorcount
```

```

\ifnum\@dtl@authorcount=2\relax
  \DTLtwoand
\else
  \DTLlandlast
\fi
\expandafter\DTLformatauthor\@dtl@author
\else
  \DTLlandnotlast \expandafter\DTLformatauthor\@dtl@author
\fi
\fi
}%
\fi
}{}%
}

```

DTLmaxeditors The counter DTLmaxeditors indicates the maximum number of editor names to display, if there are more than that number, \etalname is used.

```

\newcounter{DTLmaxeditors}
\setcounter{DTLmaxeditors}{10}

```

DTLformatteditorlist Format a list of editor names (the list is stored in \@dtl@key@Editor):

```

\newcommand*{\DTLformatteditorlist}{%
\DTLifbibfieldexists{Editor}{%
\DTLstartsencespace
\@dtl@authorcount=0\relax
\@for\@dtl@author:=\@dtl@key@Editor\do{%
\advance\@dtl@authorcount by 1\relax}%
\@dtl@tmpcount=0\relax
\ifnum\@dtl@authorcount>\c@DTLmaxeditors
{%
\@for\@dtl@author:=\@dtl@key@Editor\do{%
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount=1\relax
\expandafter\DTLformatteditor\@dtl@author
\else
\ifnum\@dtl@tmpcount>\c@DTLmaxeditors
\DTLlandnotlast \etalname
\expandafter\DTLcheckendsperiod\expandafter{\etalname}%
\@endfortrue
\else
\DTLlandnotlast \expandafter\DTLformatteditor\@dtl@author
\fi
\fi
}%
}%
\else
\@for\@dtl@author:=\@dtl@key@Editor\do{%
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount=1\relax

```



```

\expandafter\DTLformatteditor\@dtl@author
\else
\ifnum\@dtl@tmpcount=\@dtl@authorcount
\ifnum\@dtl@authorcount=2\relax
\DTLtwoand
\else
\DTLlandlast
\fi
\expandafter\DTLformatteditor\@dtl@author
\else
\DTLlandnotlast \expandafter\DTLformatteditor\@dtl@author
\fi
\fi
}%
\fi
,
\ifnum\@dtl@authorcount=1\relax
\editorname
\expandafter\DTLcheckendsperiod\expandafter{\editorname}%
\else
\editorsname
\expandafter\DTLcheckendsperiod\expandafter{\editorsname}%
\fi
}{}%
}

```

DTLformatsurnameonly

```
\DTLformatsurnameonly{<von part>}{<surname>}{<jr
part>}{<forenames>}
```

This is used when only the surname should be displayed. (The final argument, *<forenames>*, is ignored.)

```

\newcommand*{\DTLformatsurnameonly}[4]{%
\DTLstartsencespace
\def\@dtl@tmp{#1}%
\ifx\@dtl@tmp\@empty\else#1~\fi
#2%
\def\@dtl@tmp{#3}%
\ifx\@dtl@tmp\@empty
\DTLcheckendsperiod{#2}%
\else
, #3%
\DTLcheckendsperiod{#3}%
\fi
}

```

\DTLformatforenames

```
\DTLformatforenames{<forenames>}
```

The format of an author/editor's forenames. If the forenames occur at the start of sentence, a new sentence space is added. The argument is checked to determine whether it ends with a full stop (sometimes the forenames may include initials.)

```
\newcommand*{\DTLformatforenames}[1]{%
\DTLstartsentencespace
#1%
\DTLcheckendsperiod{#1}}
```

\DTLformatabbrvforenames

```
\DTLformatabbrvforenames{\<forenames>}
```

The format of an author/editor's abbreviated forenames. The initials may or may not end in a full stop depending on the commands governing the format of \DTLstoreinitials, so the initials need to be checked using \DTLcheckendsperiod.

```
\newcommand*{\DTLformatabbrvforenames}[1]{%
\DTLstartsentencespace
\DTLstoreinitials{#1}{\@dtl@tmp}\@dtl@tmp
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}}
```

\DTLformatvon

```
\DTLformatvon{\<von part>}
```

The format of the “von” part. This does nothing if the argument is empty, otherwise it does the argument followed by a non-breakable space.

```
\newcommand*{\DTLformatvon}[1]{%
\DTLstartsentencespace
\def\@dtl@tmp{#1}%
\ifx\@dtl@tmp\@empty
\else
#1~%
\fi
}
```

\DTLformatsurname

```
\DTLformatsurname{\<surname>}
```

The format of an author/editor's surname.

```
\newcommand*{\DTLformatsurname}[1]{%
\DTLstartsentencespace
#1\DTLcheckendsperiod{#1}}
```

\DTLformatjr

```
\DTLformatjr{\<jr part>}
```

The format of the “jr” part. This does nothing if the argument is empty.

```

\newcommand*{\DTLformatjr}[1]{%
\DTLstartsencespace
\def\@dtl@tmp{#1}%
\ifx\@dtl@tmp\@empty
\else
, #1\DTLcheckendsperiod{#1}%
\fi
}

```

formatcrossrefeditor Format cross reference editors:

```

\newcommand*{\DTLformatcrossrefeditor}{%
\DTLifbibfieldexists{Editor}{%
\DTLstartsencespace
\@dtl@authorcount=0\relax
\@for\@dtl@author:=\@dtl@key@Editor\do{%
\advance\@dtl@authorcount by 1\relax}%
{\@dtl@tmpcount=0\relax
\@for\@dtl@author:=\@dtl@key@Editor\do{%
\ifnum\@dtl@authorcount=1\relax
\expandafter\DTLformatsurnameonly\@dtl@author
\else
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount=1\relax
\expandafter\DTLformatsurnameonly\@dtl@author
\else
\ifnum\@dtl@authorcount=2\relax
\ \andname\ \expandafter\DTLformatsurnameonly\@dtl@author
\else
\ \etalname
\expandafter\DTLcheckendsperiod\expandafter{\etalname}
\fi
\@endfortrue
\fi
\fi
}}%
}{}%
}

```

DTLformatvolnumpages Format volume, number and pages (of an article).

```

\newcommand*{\DTLformatvolnumpages}{%
\DTLifbibfieldexists{Volume}{%
\DTLstartsencespace
\DTLbibfield{Volume}\DTLperiodfalse}{}%
\DTLifbibfieldexists{Number}{%
\DTLstartsencespace
(\DTLbibfield{Number})\DTLperiodfalse}{}%
\DTLifbibfieldexists{Pages}{%
\DTLifanybibfieldexists{Volume,Number}{:}{}%
\DTLstartsencespace

```

```

\protected@edef\@dtl@pages{0\DTLbibfield{Pages}}%
\DTLifnumerical{\@dtl@pages}{\pagename}{\pagesname}~}%
\DTLbibfield{Pages}\DTLperiodfalse}{}%
}

```

\DTLformatbvvolume Format book volume.

```

\newcommand*\DTLformatbvvolume}{%
\DTLifbibfieldexists{Volume}{%
\ifDTLmidsentence
\volume
\else
\DTLstartsencespace
\expandafter\MakeUppercase\volume
\fi
~\DTLbibfield{Volume}%
\DTLifbibfieldexists{Series}{\ \ofname\
{\em\DTLbibfield{Series}}\DTLcheckbibfieldendsperiod{Series}}}%
\DTLcheckbibfieldendsperiod{Volume}}}%
}{}

```

Lformatchapterpages Format chapter and pages:

```

\newcommand*\DTLformatchapterpages}{%
\DTLifbibfieldexists{Chapter}{%
\DTLifbibfieldexists{Type}{%
\DTLstartsencespace
\DTLbibfield{Type}}}%
\DTLstartsencespace
\chaptername~\DTLbibfield{Chapter}%
\DTLifbibfieldexists{Pages}{\DTLaddcomma}{%
\DTLcheckbibfieldendsperiod{Chapter}}}{}%
\DTLstartsencespace
\DTLformatpages}

```

\DTLformatpages Format pages:

```

\newcommand*\DTLformatpages}{%
\DTLifbibfieldexists{Pages}{%
\DTLstartsencespace
\protected@edef\@dtl@pages{0\DTLbibfield{Pages}}%
\DTLifnumerical{\@dtl@pages}{\pagename}{\pagesname}~%
\DTLbibfield{Pages}\DTLcheckbibfieldendsperiod{Pages}}}{%
}

```

Lformatnumberseries Format number and series (of book)

```

\newcommand*\DTLformatnumberseries}{%
\DTLifbibfieldexists{Volume}{}%
\DTLifbibfieldexists{Number}{%
\ifDTLmidsentence
\number
\else

```

```

\DTLstartsentencespace
\expandafter\MakeUppercase\numbername
\fi~\DTLbibfield{Number}%
\DTLifbibfieldexists{Series}{\ \inname\ \DTLbibfield{Series}%
\DTLcheckbibfieldendsperiod{Series}}{%
\DTLcheckbibfieldendsperiod{Number}}%
}%
\DTLifbibfieldexists{Series}{%
\DTLstartsentencespace
\DTLbibfield{Series}%
\DTLcheckbibfieldendsperiod{Series}}{}}%
}%
}

```

Lformatbookcrossref Format a book cross reference.

```

\newcommand*{\DTLformatbookcrossref}{%
\DTLifbibfieldexists{Volume}{%
\ifDTLmidsentence
\ \volumename
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\volumename
\fi
~\DTLbibfield{Volume}\ \ofname\
}%
\ifDTLmidsentence
\ \inname
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\inname
\fi\ }%
\DTLifbibfieldexists{Editor}{\DTLformatcrossrefeditor}{%
\DTLifbibfieldexists{Key}{%
\DTLbibfield{Key}}{%
\DTLifbibfieldexists{Series}{%
{\em\DTLbibfield{Series}}}{}}%
}%
}%
\edef\@dtl@tmp{\DTLbibfield{CrossRef}}%
~\cite{\@dtl@tmp}%
}

```

tincolproccrossref Format ‘incollections’ cross reference.

```

\newcommand*{\DTLformatincollproccrossref}{%
\DTLifbibfieldexists{Editor}{%
\ifDTLmidsentence
\ \inname
\else
\DTLstartsentencespace

```

```

\expandafter\MakeUppercase\inname
\fi\
\DTLformatcrossrefeditor
}{%
\DTLifbibfieldexists{Key}{%
\ifDTLmidsentence
\inname
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\inname
\fi\ \DTLbibfield{Key}%
}{%
\DTLifbibfieldexists{BookTitle}{%
\ifDTLmidsentence
\inname
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\inname
\fi\ {\em\DTLbibfield{BookTitle}}}{%
}}%
\edef\@dtl@tmp{\DTLbibfield{CrossRef}}%
~\cite{\@dtl@tmp}%
}

```

formatinedbooktitle Format editor and booktitle:

```

\newcommand*{\DTLformatinedbooktitle}{%
\DTLifbibfieldexists{BookTitle}{%
\ifDTLmidsentence
\inname
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\inname
\fi\
\DTLifbibfieldexists{Editor}{%
\DTLformateditorlist\DTLaddcomma {\em\DTLbibfield{BookTitle}}%
\DTLcheckbibfieldendsperiod{BookTitle}%
}{\em\DTLbibfield{BookTitle}}%
\DTLcheckbibfieldendsperiod{BookTitle}%
}}{}}

```

\DTLformatdate Format date.

```

\newcommand*{\DTLformatdate}{%
\DTLifbibfieldexists{Year}{%
\DTLifbibfieldexists{Month}{%
\protected@edef\@dtl@tmp{\DTLbibfield{Month}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsentencespace

```

```

\expandafter\MakeUppercase\@dtl@tmp
\fi\
\DTLmidsentencefalse}{}%
\DTLstartsencespace
\DTLbibfield{Year}}{%
\DTLifbibfieldexists{Month}}{%
\protected@edef\@dtl@tmp{\DTLbibfield{Month}}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsencespace
\expandafter\MakeUppercase\@dtl@tmp
\fi
\DTLcheckbibfieldendsperiod{Month}%
}{}}

```

`\formatarticlecrossref` Format article cross reference.

```

\newcommand*{\DTLformatarticlecrossref}{%
\DTLifbibfieldexists{Key}}{%
\ifDTLmidsentence
\inname
\else
\DTLstartsencespace
\expandafter\MakeUppercase\inname
\fi
\ {\em\DTLbibfield{Key}}}{}%
\DTLifbibfieldexists{Journal}}{%
\ifDTLmidsentence
\inname
\else
\DTLstartsencespace
\expandafter\MakeUppercase\inname
\fi
\ {\em\DTLbibfield{Journal}}}{}}%
\edef\@dtl@tmp{\DTLbibfield{CrossRef}}}%
~\cite{\@dtl@tmp}%
}

```

5.5.1 ifthen conditionals

The conditionals defined in this section may be used in the optional argument of `\DTLforeachbib`. They may also be used in the first argument of `\ifthenelse`, but only if the command occurs within the body of `\DTLforeachbib`.

`\DTLbibfieldexists`

`\DTLbibfieldexists{<field label>}`

Checks if named bib field exists for current entry

```
\newcommand*{\DTLbibfieldexists}[1]{%
\TE@throw\noexpand\dtl@testbibfieldexists{#1}%
\noexpand\if@dtl@condition}
```

dtl@testbibfieldexists

```
\newcommand*{\dtl@testbibfieldexists}[1]{%
\DTLifbibfieldexists{#1}{\@dtl@conditiontrue}{\@dtl@conditionfalse}}
```

\DTLbibfieldiseq \DTLbibfieldiseq{<field label>}{<value>}

Checks if the value of the bib field given by <field label> is equal to <value>. (Uses \dtlcompare to determine if the values are equal. If the bib field doesn't exist, the condition is false.)

```
\newcommand*{\DTLbibfieldiseq}[2]{%
\TE@throw\noexpand\dtl@testbibfieldiseq{#1}{#2}%
\noexpand\if@dtl@condition}
```

dtl@testbibfieldiseq

```
\newcommand*{\dtl@testbibfieldiseq}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\toks@\expandafter{\@dtl@tmp}%
\@dtl@toks{#2}%
\edef\@dtl@docompare{\noexpand\dtlcompare{\noexpand\@dtl@tmpcount}%
{\the\toks@}{\the\@dtl@toks}}%
\@dtl@docompare
\ifnum\@dtl@tmpcount=0\relax
\@dtl@conditiontrue
\else
\@dtl@conditionfalse
\fi
}{%
\@dtl@conditionfalse}%
}
```

\DTLbibfieldislteq \DTLbibfieldislteq{<field label>}{<value>}

Checks if the value of the bib field given by <field label> is less than <value>. (If the bib field doesn't exist, the condition is false.)

```
\newcommand*{\DTLbibfieldislteq}[2]{%
\TE@throw\noexpand\dtl@testbibfieldislteq{#1}{#2}%
\noexpand\if@dtl@condition}
```

dtl@testbibfieldislteq


```

\newcommand*{\dtl@testbibfieldislt}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\toks@\expandafter{\@dtl@tmp}%
\@dtl@toks{#2}%
\edef\@dtl@docompare{\noexpand\dtlcompare{\noexpand\@dtl@tmpcount}%
{\the\toks@}{\the\@dtl@toks}}%
\@dtl@docompare
\ifnum\@dtl@tmpcount=-1\relax
\@dtl@conditiontrue
\else
\@dtl@conditionfalse
\fi
}{%
\@dtl@conditionfalse}%
}

```

`\DTLbibfieldisle` `\DTLbibfieldisle{<field label>}{<value>}`

Checks if the value of the bib field given by *<field label>* is less than or equal to *<value>*. (If the bib field doesn't exist, the condition is false.)

```

\newcommand*{\DTLbibfieldisle}[2]{%
\TE@throw\noexpand\dtl@testbibfieldisle{#1}{#2}%
\noexpand\if@dtl@condition}

```

`\dtl@testbibfieldisle`

```

\newcommand*{\dtl@testbibfieldisle}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\toks@\expandafter{\@dtl@tmp}%
\@dtl@toks{#2}%
\edef\@dtl@docompare{\noexpand\dtlcompare{\noexpand\@dtl@tmpcount}%
{\the\toks@}{\the\@dtl@toks}}%
\@dtl@docompare
\ifnum\@dtl@tmpcount<1\relax
\@dtl@conditiontrue
\else
\@dtl@conditionfalse
\fi
}{%
\@dtl@conditionfalse}%
}

```

`\DTLbibfieldisgt` `\DTLbibfieldisgt{<field label>}{<value>}`

Checks if the value of the bib field given by $\langle field label \rangle$ is greater than $\langle value \rangle$.
(If the bib field doesn't exist, the condition is false.)

```
\newcommand*{\DTLbibfieldisgt}[2]{%
\TE@throw\noexpand\dtl@testbibfieldisgt{#1}{#2}%
\noexpand\if@dtl@condition}
```

tl@testbibfieldisgt

```
\newcommand*{\dtl@testbibfieldisgt}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\toks@\expandafter{\@dtl@tmp}%
\@dtl@toks{#2}%
\edef\@dtl@docompare{\noexpand\dtlcompare{\noexpand\@dtl@tmpcount}%
{\the\toks@}{\the\@dtl@toks}}%
\@dtl@docompare
\ifnum\@dtl@tmpcount=1\relax
\@dtl@conditiontrue
\else
\@dtl@conditionfalse
\fi
}{%
\@dtl@conditionfalse}%
}
```

\DTLbibfieldisge

$\backslash\text{DTLbibfieldisge}\{\langle field label \rangle\}\{\langle value \rangle\}$

Checks if the value of the bib field given by $\langle field label \rangle$ is less than or equal to $\langle value \rangle$. (If the bib field doesn't exist, the condition is false.)

```
\newcommand*{\DTLbibfieldisge}[2]{%
\TE@throw\noexpand\dtl@testbibfieldisge{#1}{#2}%
\noexpand\if@dtl@condition}
```

tl@testbibfieldisge

```
\newcommand*{\dtl@testbibfieldisge}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\toks@\expandafter{\@dtl@tmp}%
\@dtl@toks{#2}%
\edef\@dtl@docompare{\noexpand\dtlcompare{\noexpand\@dtl@tmpcount}%
{\the\toks@}{\the\@dtl@toks}}%
\@dtl@docompare
\ifnum\@dtl@tmpcount>-1\relax
\@dtl@conditiontrue
\else
\@dtl@conditionfalse
\fi
}
```

```

\fi
}{%
\@dtl@conditionfalse}%
}

```

`\DTLbibfieldcontains` `\DTLbibfieldcontains{<field label>}{<sub string>}`

Checks if the value of the bib field given by *<field label>* contains *<sub string>*.
(If the bib field doesn't exist, the condition is false.)

```

\newcommand*{\DTLbibfieldcontains}[2]{%
\TE@throw\noexpand\dtl@testbibfieldcontains{#1}{#2}%
\noexpand\if@dtl@condition}

```

`\testbibfieldcontains`

```

\newcommand*{\dtl@testbibfieldcontains}[2]{%
\DTLifbibfieldexists{#1}{%
\expandafter\let\expandafter\@dtl@tmp\expandafter
=\csname @dtl@key@#1\endcsname
\expandafter\dtl@testifsubstring\expandafter{\@dtl@tmp}{#2}%
}{\@dtl@conditionfalse}}

```

5.6 Bibliography Style Macros

The macros defined in this section should be redefined by bibliography styles.

`\DTLthebibliography` How to format the entire bibliography:

```

\newenvironment{DTLthebibliography}[2][\boolean{true}]{%
\@dtl@tmpcount=0\relax
\@sDTLforeach{#1}{#2}{\advance\@dtl@tmpcount by 1\relax}%
\begin{thebibliography}{\number\@dtl@tmpcount}
}{\end{thebibliography}}

```

`\DTLmonthname` The monthname style. The argument must be a number from 1 to 12. By default, uses `\dtl@monthname`.

```

\newcommand*{\DTLmonthname}[1]{%
\dtl@monthname{#1}}

```

`\dtl@monthname` Full month names:

```

\newcommand*{\dtl@monthname}[1]{%
\ifcase#1%
\or January%
\or February%
\or March%
\or April%
\or May%
\or June%

```

```

\or July%
\or August%
\or September%
\or October%
\or November%
\or December%
\fi}

```

`\dtl@abbrvmonthname` Abbreviated months:

```

\newcommand*{\dtl@abbrvmonthname}[1]{%
\ifcase#1%
\or Jan.%
\or Feb.%
\or Mar.%
\or Apr.%
\or May%
\or June%
\or July%
\or Aug.%
\or Sept.%
\or Oct.%
\or Nov.%
\or Dec.%
\fi}

```

`\DTLbibitem` Define how to start a new bibitem:

```

\newcommand*{\DTLbibitem}{\bibitem{\DBIBCitekey}}

```

`\DTLmbibitem` As `\DTLbibitem` but for `\DTLmbibliography`

```

\newcommand*{\DTLmbibitem}[1]{\bibitem{#1@\DBIBCitekey}}

```

`\DTLformatauthor`

```

\DTLformatauthor{\langle von part \rangle \langle surname \rangle \langle junior part \rangle \langle forenames \rangle}

```

The format of an author's name.

```

\newcommand*{\DTLformatauthor}[4]{%
\DTLformatforenames{#4}
\DTLformatvon{#1}%
\DTLformatsurname{#2}%
\DTLformatjr{#3}}

```

`\DTLformatteditor` The format of an editor's name.

```

\newcommand*{\DTLformatteditor}[4]{%
\DTLformatforenames{#4}
\DTLformatvon{#1}%
\DTLformatsurname{#2}%
\DTLformatjr{#3}}

```

<code>\DTLformattedition</code>	The format of an edition: <code>\newcommand*{\DTLformattedition}[1]{#1 \editionname}</code>
<code>\DTLformatarticle</code>	The format of an article: <code>\newcommand{\DTLformatarticle}{}{}</code>
<code>\DTLformatbook</code>	The format of a book: <code>\newcommand{\DTLformatbook}{}{}</code>
<code>\DTLformatbooklet</code>	The format of a booklet: <code>\newcommand{\DTLformatbooklet}{}{}</code>
<code>\DTLformatinbook</code>	The format of an “inbook” type: <code>\newcommand{\DTLformatinbook}{}{}</code>
<code>\DTLformatincollection</code>	The format of an “incollection” type: <code>\newcommand{\DTLformatincollection}{}{}</code>
<code>\DTLformatinproceedings</code>	The format of an “inproceedings” type: <code>\newcommand{\DTLformatinproceedings}{}{}</code>
<code>\DTLformatmanual</code>	The format of a manual: <code>\newcommand{\DTLformatmanual}{}{}</code>
<code>\DTLformatmastersthesis</code>	The format of a master’s thesis: <code>\newcommand{\DTLformatmastersthesis}{}{}</code>
<code>\DTLformatmisc</code>	The format of a miscellaneous entry: <code>\newcommand{\DTLformatmisc}{}{}</code>
<code>\DTLformatphdthesis</code>	The format of a Ph.D. thesis: <code>\newcommand{\DTLformatphdthesis}{}{}</code>
<code>\DTLformatproceedings</code>	The format of a proceedings: <code>\newcommand{\DTLformatproceedings}{}{}</code>
<code>\DTLformattechreport</code>	The format of a technical report: <code>\newcommand{\DTLformattechreport}{}{}</code>
<code>\DTLformatunpublished</code>	The format of an unpublished work: <code>\newcommand{\DTLformatunpublished}{}{}</code>
	Predefined names (these correspond to the standard BibTeX predefined strings of the same name without the leading <code>\DTL</code>):
<code>\DTLacmcs</code>	<code>\newcommand*{\DTLacmcs}{ACM Computing Surveys}</code>

<code>\DTLacta</code>	<code>\newcommand*{\DTLacta}{Acta Informatica}</code>
<code>\DTLcacm</code>	<code>\newcommand*{\DTLcacm}{Communications of the ACM}</code>
<code>\DTLibmjrd</code>	<code>\newcommand*{\DTLibmjrd}{IBM Journal of Research and Development}</code>
<code>\DTLibmsj</code>	<code>\newcommand*{\DTLibmsj}{IBM Systems Journal}</code>
<code>\DTLIEEESE</code>	<code>\newcommand*{\DTLIEEESE}{IEEE Transactions on Software Engineering}</code>
<code>\DTLIEEECTC</code>	<code>\newcommand*{\DTLIEEECTC}{IEEE Transactions on Computers}</code>
<code>\DTLIEEECTCAD</code>	<code>\newcommand*{\DTLIEEECTCAD}{IEEE Transactions on Computer-Aided Design of Integrated Circuits}</code>
<code>\DTLipl</code>	<code>\newcommand*{\DTLipl}{Information Processing Letters}</code>
<code>\DTLjacm</code>	<code>\newcommand*{\DTLjacm}{Journal of the ACM}</code>
<code>\DTLjcscs</code>	<code>\newcommand*{\DTLjcscs}{Journal of Computer and System Sciences}</code>
<code>\DTLscp</code>	<code>\newcommand*{\DTLscp}{Science of Computer Programming}</code>
<code>\DTLsicomp</code>	<code>\newcommand*{\DTLsicomp}{SIAM Journal on Computing}</code>
<code>\DTLtocs</code>	<code>\newcommand*{\DTLtocs}{ACM Transactions on Computer Systems}</code>
<code>\DTLtods</code>	<code>\newcommand*{\DTLtods}{ACM Transactions on Database Systems}</code>
<code>\DTLtog</code>	<code>\newcommand*{\DTLtog}{ACM Transactions on Graphics}</code>

```

\DTLtoms
\newcommand*\DTLtoms{ACM Transactions on Mathematical Software}

\DTLtoois
\newcommand*\DTLtoois{ACM Transactions on Office Information
Systems}

\DTLtoplas
\newcommand*\DTLtoplas{ACM Transactions on Programming Languages
and Systems}

\DTLtcs
\newcommand*\DTLtcs{Theoretical Computer Science}

```

5.7 Bibliography Styles

Each bibliography style is set by the command `\dtlbst@<style>`, where `<style>` is the name of the bibliography style.

```

\dtlbst@plain The 'plain' style:
\newcommand*\dtlbst@plain{%
Set how to format the entire bibliography:
\renewenvironment{DTLthebibliography}[2][\boolean{true}]{%
\@dtl@tmpcount=0\relax
\@sDTLforeach{##1}{##2}{\advance\@dtl@tmpcount by 1\relax}%
\begin{thebibliography}{\number\@dtl@tmpcount}%
}{\end{thebibliography}}%
Set how to start the bibliography entry:
\renewcommand*\DTLbibitem{\bibitem{DBIBcitekey}}%
\renewcommand*\DTLmbibitem[1]{\bibitem{##1@DBIBcitekey}}%
Sets the author name format.
\renewcommand*\DTLformatauthor[4]{%
\DTLformatforenames{##4}
\DTLformatvon{##1}%
\DTLformatsurname{##2}%
\DTLformatjr{##3}}
Sets the editor name format.
\renewcommand*\DTLformatteditor[4]{%
\DTLformatforenames{##4}
\DTLformatvon{##1}%
\DTLformatsurname{##2}%
\DTLformatjr{##3}}
Sets the edition format.
\renewcommand*\DTLformatedition[1]{##1 \editionname}%

```

Sets the monthname format.

```
\let\DTLmonthname\dtl@monthname
```

Sets other predefined names:

```
\renewcommand*{\DTLacmcs}{ACM Computing Surveys}
\renewcommand*{\DTLacta}{Acta Informatica}
\renewcommand*{\DTLcacm}{Communications of the ACM}
\renewcommand*{\DTLibmjrd}{IBM Journal of Research and Development}
\renewcommand*{\DTLibmsj}{IBM Systems Journal}
\renewcommand*{\DTLIEEE}{IEEE Transactions on Software Engineering}
\renewcommand*{\DTLIEEEetc}{IEEE Transactions on Computers}
\renewcommand*{\DTLIEEEetcad}{IEEE Transactions on Computer-Aided Design
of Integrated Circuits}
\renewcommand*{\DTLipl}{Information Processing Letters}
\renewcommand*{\DTLjacm}{Journal of the ACM}
\renewcommand*{\DTLjcsc}{Journal of Computer and System Sciences}
\renewcommand*{\DTLscp}{Science of Computer Programming}
\renewcommand*{\DTLscomp}{SIAM Journal on Computing}
\renewcommand*{\DTLtocs}{ACM Transactions on Computer Systems}
\renewcommand*{\DTLtods}{ACM Transactions on Database Systems}
\renewcommand*{\DTLtog}{ACM Transactions on Graphics}
\renewcommand*{\DTLtoms}{ACM Transactions on Mathematical Software}
\renewcommand*{\DTLtoois}{ACM Transactions on Office Information
Systems}
\renewcommand*{\DTLtoplas}{ACM Transactions on Programming Languages
and Systems}
\renewcommand*{\DTLtcs}{Theoretical Computer Science}
```

The format of an article.

```
\renewcommand*{\DTLformatarticle}{%
\DTLformatauthorlist
\DTLifbibfieldexists{Author}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}{}%
\DTLifbibfieldexists{CrossRef}{%
% cross ref field
\DTLformatarticlecrossref
\DTLifbibfieldexists{Pages}{\DTLaddcomma}{}%
\DTLformatpages
\DTLaddperiod
}{% no cross ref field
\DTLifbibfieldexists{Journal}{\DTLstartsentencespace
{\em\DTLbibfield{Journal}}}%
\DTLcheckbibfieldendsperiod{Journal}%
\DTLifanybibfieldexists{Number,Volume,Pages,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatvolnumpages
\DTLifanybibfieldexists{Volume,Number,Pages}{%
```



```

\DTLifanybibfieldexists{Year,Month}{\DTLaddcomma}{%
\DTLaddperiod}%
\DTLmidsentencefalse}{}%
\DTLformatdate
\DTLifanybibfieldexists{Year,Month}{\DTLaddperiod}{}%
}%
\DTLifbibfieldexists{Note}{\DTLstartsentencespace\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}

```

The format of a book.

```

\renewcommand*{\DTLformatbook}{%
\DTLifbibfieldexists{Author}{%
\DTLformatauthorlist\DTLaddperiod
}{\DTLformatteditorlist\DTLifbibfieldexists{Editor}{%
\DTLaddperiod}{}}%
\DTLifbibfieldexists{Title}{\DTLstartsentencespace
{\em\DTLbibfield{Title}}}%
\DTLcheckbibfieldendsperiod{Title}}}%
\DTLifbibfieldexists{CrossRef}{%
% cross ref field
\DTLifbibfieldexists{Title}{\DTLaddperiod}{}%
\DTLformatbookcrossref
\DTLifanybibfieldexists{Edition,Month,Year}{\DTLaddcomma
}{\DTLaddperiod}%
}{% no cross ref field
\DTLifbibfieldexists{Title}{%
\DTLifbibfieldexists{Volume}{\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatbvvolume
\DTLformatnumberseries
\DTLifanybibfieldexists{Number,Series,Volume}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Publisher}{\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLifbibfieldexists{Address}{\DTLaddcomma}{%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma
}{\DTLaddperiod}%
}}}%
\DTLifbibfieldexists{Address}{\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}}}%
}%
\DTLifbibfieldexists{Edition}{%
\protected@edef\@dtl@tmp{\DTLformattedition{\DTLbibfield{Edition}}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsentencespace\expandafter\MakeUppercase\@dtl@tmp

```

```

\fi
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}%
}{}%
\DTLformatdate
\DTLifanybibfieldexists{Year,Month}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Note}{\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%

```

The format of a booklet.

```

\renewcommand*{\DTLformatbooklet}{%
\DTLifbibfieldexists{Author}{%
\DTLformatauthorlist\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{\DTLstartsentencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}{}%
\DTLifbibfieldexists{HowPublished}{%
\DTLstartsentencespace\DTLbibfield{HowPublished}%
\DTLcheckbibfieldendsperiod{HowPublished}%
\DTLifanybibfieldexists{Address,Month,Year}{\DTLaddcomma
}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Address}{\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatdate
\DTLifanybibfieldexists{Year,Month}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Note}{\DTLstartsentencespace\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%

```

The format of an ‘inbook’ entry.

```

\renewcommand*{\DTLformatinbook}{%
\DTLifbibfieldexists{Author}{%
\DTLformatauthorlist\DTLaddperiod}{%
\DTLifbibfieldexists{Editor}{\DTLformatteditorlist\DTLaddperiod}}}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
{\em\DTLbibfield{Title}}%
\DTLcheckbibfieldendsperiod{Title}%
}{}%
\DTLifbibfieldexists{CrossRef}{%
% Cross ref entry
\DTLifbibfieldexists{Title}{%
\DTLifbibfieldexists{Chapter}{\DTLaddcomma}{\DTLaddperiod}}}%

```

```

\DTLformatchapterpages
\DTLifanybibfieldexists{Chapter,Pages}{\DTLaddperiod}{}%
\DTLformatbookcrossref
}{% no cross ref
\DTLifbibfieldexists{Title}{%
\DTLifanybibfieldexists{Chapter,Volume}{\DTLaddcomma
}{\DTLaddperiod}{}%
\DTLformatbvvolume
\DTLifanybibfieldexists{Volume,Series}{%
\DTLifanybibfieldexists{Chapter,Pages}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatchapterpages
\DTLifanybibfieldexists{Chapter,Pages}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLifbibfieldexists{Address}{\DTLaddcomma}{}{}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}{}{}%
}%
\DTLifanybibfieldexists{Edition,Month,Year}{\DTLaddcomma
}{\DTLaddperiod}%
\DTLifbibfieldexists{Edition}{%
\protected@edef\@dtl@tmp{\DTLformattedition{\DTLbibfield{Edition}}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\@dtl@tmp
\fi
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma
}{\DTLaddperiod}%
}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%

```

The format of an ‘incollection’ entry.

```

\renewcommand*{\DTLformatincollection}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{%

```

```

\DTLstartsentencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}{}%
\DTLifbibfieldexists{CrossRef}{%
% cross ref entry
\DTLformatincollproccrossref
\DTLifanybibfieldexists{Chapter,Pages}{\DTLaddcomma}{}%
\DTLformatchapterpages\DTLaddperiod
}{% no cross ref entry
\DTLformatinedbooktitle
\DTLifbibfieldexists{BookTitle}{%
\DTLifanybibfieldexists{Volume,Series,Chapter,Pages,Number}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatbvvolume
\DTLifbibfieldexists{Volume}{%
\DTLifanybibfieldexists{Number,Series,Chapter,Pages}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatnumberseries
\DTLifanybibfieldexists{Number,Series}{%
\DTLifanybibfieldexists{Chapter,Pages}{\DTLaddcomma
}{\DTLaddperiod}}}%
\DTLformatchapterpages
\DTLifanybibfieldexists{Chapter,Pages}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLifanybibfieldexists{Address,Edition,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Edition,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Edition}{%
\protected@edef\@dtl@tmp{\DTLformattedition{\DTLbibfield{Edition}}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\@dtl@tmp
\fi
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma
}{\DTLaddperiod}%
}{}%
\DTLformatdate

```

```

\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%

```

The format of an ‘inproceedings’ entry.

```

\renewcommand*{\DTLformatinproceedings}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist
\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}{}%
\DTLifbibfieldexists{CrossRef}{%
% cross ref entry
\DTLformatincolprocrossref
\DTLifbibfieldexists{Pages}{\DTLaddcomma}{%
\DTLaddperiod}%
\DTLformatpages
\DTLifbibfieldexists{Pages}{\DTLaddperiod}{}%
}{% no cross ref
\DTLformatinedbooktitle
\DTLifbibfieldexists{BookTitle}{%
\DTLifanybibfieldexists{Volume,Series,Pages,Number,Address,%
Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatbvvolume
\DTLifbibfieldexists{Volume}{%
\DTLifanybibfieldexists{Number,Series,Pages,Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatnumberseries
\DTLifanybibfieldexists{Number,Series}{%
\DTLifanybibfieldexists{Pages,Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatpages
\DTLifbibfieldexists{Pages}{%
\DTLifanybibfieldexists{Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}%
\DTLformatdate

```

```

\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLifbibfieldexists{Publisher}{\DTLaddcomma}{%
\DTLaddperiod}{}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLaddperiod}{}%
}%
\DTLifanybibfieldexists{Publisher,Organization}{%
\DTLaddperiod}{}%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLifanybibfieldexists{Publisher,Month,Year}{%
\DTLaddcomma}{}}}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}}}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
}%
}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%

```

The format of a manual.

```

\renewcommand*{\DTLformatmanual}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist
\DTLaddperiod}{%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLifbibfieldexists{Address}{\DTLaddcomma \DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
}}}%
\DTLaddperiod}{}%

```

```

}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
{\em\DTLbibfield{Title}}}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLifbibfieldexists{Author}{%
\DTLifanybibfieldexists{Organization,Address}{%
\DTLaddperiod}{\DTLaddcomma}}{%
\DTLifanybibfieldexists{Organization,Address,Edition,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}{}%
\DTLifbibfieldexists{Author}{%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLifanybibfieldexists{Address,Edition,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}{}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Edition,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}{}%
}%
\DTLifbibfieldexists{Organization}{}{%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Edition,Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}}}{}}}%
}%
\DTLifbibfieldexists{Edition}{%
\protected@edef\@dtl@tmp{\DTLformattedition{\DTLbibfield{Edition}}}%
\ifDTLmidsentence
\@dtl@tmp
\else
\DTLstartsentencespace
\expandafter\MakeUppercase\@dtl@tmp
\fi
\expandafter\DTLcheckendsperiod\expandafter{\@dtl@tmp}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}}}{}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%

```

```
\DTLaddperiod}{}%
}%
```

The format of a master's thesis.

```
\renewcommand*{\DTLformatmastersthesis}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}{}%
\DTLifbibfieldexists{Type}{%
\DTLstartsencespace
\DTLbibfield{Type}%
\DTLcheckbibfieldendsperiod{Type}%
\DTLifanybibfieldexists{School,Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLifbibfieldexists{School}{%
\DTLstartsencespace
\DTLbibfield{School}%
\DTLcheckbibfieldendsperiod{School}%
\DTLifanybibfieldexists{Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Address}{%
\DTLstartsencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}{}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}{}%
\DTLifbibfieldexists{Note}{%
\DTLstartsencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}{}%
}%
```

The format of a miscellaneous entry.

```
\renewcommand*{\DTLformatmisc}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLifbibfieldexists{HowPublished}{\DTLaddperiod}{%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}%
}%
\DTLmidsentencefalse}{}%
```



```

\DTLifbibfieldexists{HowPublished}{%
\DTLstartsentencespace
\DTLbibfield{HowPublished}%
\DTLcheckbibfieldendsperiod{HowPublished}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{%
\DTLaddperiod}}}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}}}%
}%

```

The format of a PhD thesis.

```

\renewcommand*{\DTLformatphdthesis}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}}}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
{\em\DTLbibfield{Title}}}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}}}%
\DTLifbibfieldexists{Type}{%
\DTLstartsentencespace
\DTLbibfield{Type}%
\DTLcheckbibfieldendsperiod{Type}%
\DTLifanybibfieldexists{School,Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLifbibfieldexists{School}{%
\DTLstartsentencespace
\DTLbibfield{School}%
\DTLcheckbibfieldendsperiod{School}%
\DTLifanybibfieldexists{Address,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}}}%
}%

```

The format of a proceedings.

```

\renewcommand*{\DTLformatproceedings}{%
\DTLifbibfieldexists{Editor}{%
\DTLformatteditorlist\DTLaddperiod}{%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLaddperiod}{}}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
{\em\DTLbibfield{Title}}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLifanybibfieldexists{Volume,Number,Address,Editor,Publisher,%
Month,Year}{\DTLaddcomma}{\DTLaddperiod}%
}}%
\DTLformatbvvolume
\DTLifbibfieldexists{Volume}{%
\DTLifanybibfieldexists{Number,Address,Editor,Publisher,%
Month,Year}{\DTLaddcomma}{\DTLaddperiod}}}%
\DTLformatnumberseries
\DTLifbibfieldexists{Number}{%
\DTLifanybibfieldexists{Address,Editor,Publisher,%
Month,Year}{\DTLaddcomma}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}}%
\DTLifbibfieldexists{Editor}{\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%
\DTLifbibfieldexists{Publisher}{%
\DTLaddcomma}{\DTLaddperiod}}}}}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLaddperiod
}}%
}% no address
\DTLifbibfieldexists{Editor}{%
\DTLifbibfieldexists{Organization}{%
\DTLstartsentencespace
\DTLbibfield{Organization}%
\DTLcheckbibfieldendsperiod{Organization}%

```

```

\DTLifanybibfieldexists{Publisher,Month,Year}{%
\DTLaddcomma}{\DTLaddperiod}}{}%
}%}%
\DTLifbibfieldexists{Publisher}{%
\DTLstartsentencespace
\DTLbibfield{Publisher}%
\DTLcheckbibfieldendsperiod{Publisher}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}}{}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}{}%
}%
\DTLifbibfieldexists{Note}{%
\DTLstartsentencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}}{}%
}%

```

The format of a technical report.

```

\renewcommand*{\DTLformattechreport}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsentencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}}{}%
\DTLifbibfieldexists{Type}{%
\DTLstartsentencespace
\DTLbibfield{Type}%
\DTLcheckbibfieldendsperiod{Type}%
\DTLifbibfieldexists{Number}{~}}{}{}%
\DTLifbibfieldexists{Number}{%
\DTLstartsentencespace
\DTLbibfield{Number}%
\DTLcheckbibfieldendsperiod{Number}%
}%}%
\DTLifanybibfieldexists{Type,Number}{%
\DTLifanybibfieldexists{Institution,Address,Month,Year}{\DTLaddcomma
}{\DTLaddperiod}}{}%
\DTLifbibfieldexists{Institution}{%
\DTLstartsentencespace
\DTLbibfield{Institution}%
\DTLcheckbibfieldendsperiod{Institution}%
\DTLifanybibfieldexists{Address,Month,Year}{\DTLaddcomma
}{\DTLaddperiod}}{}%
\DTLifbibfieldexists{Address}{%
\DTLstartsentencespace
\DTLbibfield{Address}%
\DTLcheckbibfieldendsperiod{Address}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma

```

```

}{\DTLaddperiod}}{}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}{}%
\DTLifbibfieldexists{Note}{%
\DTLstartsencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLaddperiod}}{}%
}%

```

The format of an unpublished work.

```

\renewcommand*{\DTLformatunpublished}{%
\DTLifbibfieldexists{Author}{\DTLformatauthorlist\DTLaddperiod}}{}%
\DTLifbibfieldexists{Title}{%
\DTLstartsencespace
\DTLbibfield{Title}%
\DTLcheckbibfieldendsperiod{Title}%
\DTLaddperiod}}{}%
\DTLifbibfieldexists{Note}{%
\DTLstartsencespace
\DTLbibfield{Note}%
\DTLcheckbibfieldendsperiod{Note}%
\DTLifanybibfieldexists{Month,Year}{\DTLaddcomma}{\DTLaddperiod}}{}%
\DTLformatdate
\DTLifanybibfieldexists{Month,Year}{\DTLaddperiod}}{}%
}%

```

End of 'plain' style.

```

}

```

`\dtlbst@abbrv` Define 'abbrv' style. This is similar to 'plain' except that some of the values are abbreviated

```

\newcommand{\dtlbst@abbrv}{%

```

Base this style on 'plain':

```

\dtlbst@plain

```

Sets the author name format.

```

\renewcommand*{\DTLformatauthor}[4]{%
\DTLformatabbrvforenames{##4}
\DTLformatvon{##1}%
\DTLformatsurname{##2}%
\DTLformatjr{##3}}

```

Sets the editor name format.

```

\renewcommand*{\DTLformatteditor}[4]{%
\DTLformatabbrvforenames{##4}
\DTLformatvon{##1}%
\DTLformatsurname{##2}%
\DTLformatjr{##3}}

```

Sets the monthname format.

```
\let\DTLmonthname\dtl@abbrvmonthname
```

Sets other predefined names:

```
\renewcommand*{\DTLacmcs}{ACM Comput.\ Surv.}
\renewcommand*{\DTLacta}{Acta Inf.}
\renewcommand*{\DTLcacm}{Commun.\ ACM}
\renewcommand*{\DTLibmjrd}{IBM J.\ Res.\ Dev.}
\renewcommand*{\DTLibmsj}{IBM Syst.\ J.}
\renewcommand*{\DTLIEEEese}{IEEE Trans. Softw.\ Eng.}
\renewcommand*{\DTLIEEEetc}{IEEE Trans.\ Comput.}
\renewcommand*{\DTLIEEEetcad}{IEEE Trans.\ Comput.-Aided Design
Integrated Circuits}
\renewcommand*{\DTLipl}{Inf.\ Process.\ Lett.}
\renewcommand*{\DTLjacm}{J.\ ACM}
\renewcommand*{\DTLjcss}{J.\ Comput.\ Syst.\ Sci.}
\renewcommand*{\DTLscpi}{Sci.\ Comput.\ Programming}
\renewcommand*{\DTLscomp}{SIAM J.\ Comput.}
\renewcommand*{\DTLtocs}{ACM Trans.\ Comput.\ Syst.}
\renewcommand*{\DTLtods}{ACM Trans.\ Database Syst.}
\renewcommand*{\DTLtog}{ACM Trans.\ Gr.}
\renewcommand*{\DTLtoms}{ACM Trans.\ Math. Softw.}
\renewcommand*{\DTLtoois}{ACM Trans. Office Inf.\ Syst.}
\renewcommand*{\DTLtoplas}{ACM Trans.\ Prog. Lang.\ Syst.}
\renewcommand*{\DTLtcs}{Theoretical Comput.\ Sci.}
```

End of ‘abbrv’ style.

```
}
```

`\dtlbst@alpha` Define ‘alpha’ style. This is similar to ‘plain’ except that the labels are strings rather than numerical.

```
\newcommand{\dtlbst@alpha}{%
```

Base this style on ‘plain’:

```
\dtlbst@plain
```

Set how to format the entire bibliography:

```
\renewenvironment{DTLthebibliography}[2][\boolean{true}]{%
\dtl@createalphabiblabels{##1}{##2}%
\begin{thebibliography}{\@dtl@widestlabel}%
}{\end{thebibliography}}%
```

Set how to start the bibliography entry:

```
\renewcommand*{\DTLbibitem}{%
\expandafter\@bibitem\expandafter
[\csname dtl@biblabel@DBIBcitekey\endcsname]{\DBIBcitekey}%
\renewcommand*{\DTLmbibitem}[1]{%
\expandafter\@bibitem\expandafter
[\csname dtl@biblabel@DBIBcitekey\endcsname]{##1@DBIBcitekey}}%
```

End of ‘alpha’ style.

}

createalphabiblabels

\dtl@createalphabiblabels{<condition>}{<db name>}

Constructs the alpha style bib labels for the given database. (Labels are stored in the control sequence \dtl@biblabel@<citekey>.) This also sets \dtl@widestlabel to the widest label.

```
\newcommand*{\dtl@createalphabiblabels}[2]{%
\dtl@message{Creating bib labels}%
\begingroup
\gdef\dtl@widestlabel{}%
\dtl@widest=0pt\relax
\DTLforeachbibentry[#1]{#2}{%
\dtl@message{\DBIBcitekey}%
\DTLifbibfieldexists{Author}{%
\dtl@listgetalphalabel{\dtl@thislabel}{\dtl@key@Author}%
}%
\DTLifbibfieldexists{Editor}{%
\dtl@listgetalphalabel{\dtl@thislabel}{\dtl@key@Editor}%
}%
\DTLifbibfieldexists{Key}{%
\expandafter\dtl@get@firstthree\expandafter
{\dtl@key@Key}{\dtl@thislabel}%
}%
\DTLifbibfieldexists{Organization}{%
\expandafter\dtl@get@firstthree\expandafter
{\dtl@key@Organization}{\dtl@thislabel}%
}%
\expandafter\dtl@get@firstthree\expandafter
{\DBIBentrytype}{\dtl@thislabel}%
}%
}}%
\DTLifbibfieldexists{Year}{%
\DTLifbibfieldexists{CrossRef}{%
\DTLgetvalueforkey{\dtl@key@Year}{Year}{#2}{CiteKey}{%
\dtl@key@CrossRef}}}%
\DTLifbibfieldexists{Year}{%
\expandafter\dtl@get@yearsuffix\expandafter{\dtl@key@Year}%
\expandafter\toks@\expandafter{\dtl@thislabel}%
\expandafter\dtl@toks\expandafter{\dtl@year}%
\edef\dtl@thislabel{\the\toks@\the\dtl@toks}%
}%
\let\dtl@s@thislabel=\dtl@thislabel
\@onelevel@sanitize\dtl@s@thislabel
\@ifundefined{c@biblabel@\dtl@s@thislabel}{%
\newcounter{biblabel@\dtl@s@thislabel}%
\setcounter{biblabel@\dtl@s@thislabel}{1}%
}
```

```

\expandafter\edef\csname @dtl@bibfirst@\@dtl@s@thislabel\endcsname{%
\DBIBCitekey}%
\expandafter\global
\expandafter\let\csname dtl@biblabel@\DBIBCitekey\endcsname=
\@dtl@thislabel
}%
\expandafter\ifnum\csname c@biblabel@\@dtl@s@thislabel\endcsname=1\relax
\expandafter\let\expandafter\@dtl@tmp
\csname @dtl@bibfirst@\@dtl@s@thislabel\endcsname
\expandafter\protected\xdef\csname dtl@biblabel@\@dtl@tmp\endcsname{%
\@dtl@thislabel a}%
\fi
\stepcounter{biblabel@\@dtl@s@thislabel}%
\expandafter\protected\xdef\csname dtl@biblabel@\DBIBCitekey\endcsname{%
\@dtl@thislabel\alph{biblabel@\@dtl@s@thislabel}}%
}%
\settowidth{\dtl@tmplength}{%
\csname dtl@biblabel@\DBIBCitekey\endcsname}%
\ifdim\dtl@tmplength>\dtl@widest
\dtl@widest=\dtl@tmplength
\expandafter\global\expandafter\let\expandafter\@dtl@widestlabel
\expandafter=\csname dtl@biblabel@\DBIBCitekey\endcsname
\fi
}%
\endgroup
}

```

`\dtl@listgetalphalabel` Determine the alpha style label from a list of authors/editors (the first argument must be a control sequence (in which the label is stored), the second argument must be the list of names.)

```

\newcommand*{\dtl@listgetalphalabel}[2]{%
\@dtl@authorcount=0\relax
\@for\@dtl@author:=#2\do{%
\advance\@dtl@authorcount by 1\relax}%
\ifnum\@dtl@authorcount=1\relax
\expandafter\dtl@getsinglealphalabel#2{#1}\relax
\else
{%
\xdef#1{}%
\@dtl@tmpcount=0\relax
\def\DTLafterinitials{}\def\DTLbetweeninitials{}%
\def\DTLafterinitialbeforehyphen{}\def\DTLinitialhyphen{}%
\@for\@dtl@author:=#2\do{%
\expandafter\dtl@getauthorinitial\@dtl@author
\expandafter\toks@\expandafter{\@dtl@tmp}%
\expandafter\@dtl@toks\expandafter{#1}%
\xdef#1{\the\@dtl@toks\the\toks@}%
\advance\@dtl@tmpcount by 1\relax
\ifnum\@dtl@tmpcount>2\relax\@endfortrue\fi
}
}

```

```

    }}%
\fi
}

```

Get author's initial (stores in \@dtl@tmp):

```

\newcommand*{\dtl@getauthorinitial}[4]{%
\def\@dtl@vonpart{#1}%
\ifx\@dtl@vonpart\@empty
\DTLstoreinitials{#2}{\@dtl@tmp}%
\else
\DTLstoreinitials{#1 #2}{\@dtl@tmp}%
\fi}

```

Get label for single author (last argument is control sequence in which to store the label):

```

\newcommand*{\dtl@getsinglealphalabel}[5]{%
\def\@dtl@vonpart{#1}%
\ifx\@dtl@vonpart\@empty
\DTLifSubString{#2}{-}{%
{\def\DTLafterinitials{}\def\DTLbetweeninitials{}%
\def\DTLafterinitialbeforehyphen{}%
\def\DTLinitialhyphen{}%
\DTLstoreinitials{#2}{\@dtl@tmp}\global\let#5=\@dtl@tmp}%
}{%
\dtl@getfirstthree{#5}#2{}{}{}{}\@nil
}
\else
{\def\DTLafterinitials{}\def\DTLbetweeninitials{}%
\def\DTLafterinitialbeforehyphen{}%
\def\DTLinitialhyphen{}%
\DTLstoreinitials{#1 #2}{\@dtl@tmp}\global\let#5=\@dtl@tmp}%
\fi
}

```

Get first three letters from the given string:

```

\def\dtl@getfirstthree#1#2#3#4#5\@nil{%
\def#1{#2#3#4}%
}
\newcommand*{\dtl@get@firstthree}[2]{%
\dtl@getfirstthree#2#1{}{}{}{}{}\@nil}

```

Get year suffix:

```

\newcommand*{\dtl@get@yearsuffix}[1]{%
\dtl@getyearsuffix#1\@nil\relax\relax}

\def\dtl@getyearsuffix#1#2#3{%
\def\@dtl@argi{#1}\def\@dtl@argii{#2}%
\def\@dtl@argiii{#3}%
\ifx\@dtl@argi\@nnil
\def\@dtl@year{}%

```



```

\let\@dtl@donext=\relax
\else
\ifx\@dtl@argii\@nnil
\dtl@ifsingle{#1}{%
\def\@dtl@year{#1}%
\let\@dtl@donext=\relax
}%
\def\@dtl@donext{\dtl@getyearsuffix#1#2#3}%
}%
\else
\ifx\@dtl@argiii\@nnil
\dtl@ifsingle{#1}{%
\dtl@ifsingle{#2}{%
\def\@dtl@year{#1#2}%
\let\@dtl@donext=\relax
}%
\def\@dtl@donext{\dtl@getyearsuffix#2#3}%
}%
}%
\def\@dtl@donext{\dtl@getyearsuffix{#2}{#3}}%
}%
\else
\def\@dtl@donext{\dtl@getyearsuffix{#2}{#3}}%
\fi
\fi
\fi
\@dtl@donext
}

```

DTLbibliographystyle

`\DTLbibliographystyle{<style>}`

Sets the bibliography style.

```

\newcommand*{\DTLbibliographystyle}[1]{%
\@ifundefined{dtlbst@#1}{\PackageError{databib}{Unknown
bibliography style ‘#1’}{\csname dtlbst@#1\endcsname}}

```

Set the default bibliography style:

```

\DTLbibliographystyle{\dtlbib@style}

```

5.8 Multiple Bibliographies

In order to have multiple bibliographies, there needs to be an aux file for each bibliography. The main bibliography is in `\jobname.aux`, but need to provide a means of creating additional aux files.

`\DTLmultibibs`

`\DTLmultibibs{<list>}`

This creates an auxiliary file for each name in $\langle list \rangle$. For example, $\backslash\text{DTLmultibibs}\{\text{foo},\text{bar}\}$ will create the files `foo.aux` and `bar.aux`.

```
\newcommand*\DTLmultibibs[1]{%
\@for\dtl@af:=#1\do{%
\@ifundefined{dtl@aux@\dtl@af}{%
\expandafter\newwrite\csname dtl@aux@\dtl@af\endcsname
\expandafter\immediate
\expandafter\openout\csname dtl@aux@\dtl@af\endcsname=\dtl@af.aux
\expandafter\def\csname b@\dtl@af @*\endcsname{}%
}%
\PackageError{datbib}{Can't create auxiliary file '\dtl@af.aux',
\expandafter\string\csname dtl@aux@\dtl@af\endcsname\space
already exists}{}}}
```

Can only be used in the preamble:

```
\@onlypreamble{\DTLmultibibs}
```

$\backslash\text{DTLcite}$ $\backslash\text{DTLcite}[\langle text \rangle]\{\langle mbib \rangle\}\{\langle labels \rangle\}$

This is similar to $\backslash\text{cite}[\langle text \rangle]\{\langle labels \rangle\}$, except 1) the cite information is written to the auxiliary file associated with the multi-bib (*mbib*) (which must be named in $\backslash\text{DTLmultibibs}$) and 2) the cross referencing label is constructed from $\langle mbib \rangle$ and $\langle label \rangle$ to allow for the same citation to appear in multiple bibliographies.

```
\newcommand*\DTLcite{\@ifnextchar[\@tempwatrue \dtl@citex
}{\@tempwafalse \dtl@citex[]}}
```

$\backslash\text{dtl@citex}$

```
\def\dtl@citex[#1]#2#3{%
\leavevmode\let\@citea\@empty
\@cite{\@for\@citeb:=#3\do{\@citea
\def\@citea{\penalty \@m \ }%
\edef\@citeb{\expandafter\@firstofone\@citeb\@empty}%
\if@files
\@ifundefined{dtl@aux#2}{%
\PackageError{datbib}{multibib '#2' not defined}{%
You need to define '#2' in \string\DTLmultibibs}%
}%
\expandafter\immediate
\expandafter\write\csname dtl@aux#2\endcsname{%
\string\citation{\@citeb}}%
}%
\fi
\@ifundefined{b#2@\@citeb}{%
\hbox{\reset@font\bfseries ?}%
\G@refundefinedtrue
\@latexwarning{Citation '\@citeb' on page \thepage \space
```

```

        undefined}%
    }{%
        \@cite@ofmt{\csname b@#2@\@citeb \endcsname }%
    }%
}}{#1}%
}

```

`\DTLnocite` `\DTLnocite{<mbib>}{<key list>}`

As `\nocite` but uses the aux file associated with `<mbib>` which must have been defined using `\DTLmultibibs`.

```

\newcommand*{\DTLnocite}[2]{%
\@ifundefined{dtl@aux@#1}{%
    \PackageError{datbib}{multibib ‘#1’ not defined}{%
        You need to define ‘#1’ in \string\DTLmutlibibs}%
    }{%
        \@sphack
        \ifx\@onlypreamble\document
            \@for\@citeb:=#2\do{%
                \edef\@citeb{\expandafter\@firstofone\@citeb}%
                \if@filesw
                    \expandafter\immediate
                    \expandafter\write\csname dtl@aux@#1\endcsname{%
                        \string\citation{\@citeb}}%
                \fi
                \@ifundefined{b@#1@\@citeb}{%
                    \G@refundefinedtrue
                    \@latex@warning{Citation ‘\@citeb ’ undefined}}{}%
            }%
        \else
            \@latex@error{Cannot be used in preamble}\@eha
        \fi
        \@sphack
    }%
}

```

`\DTLloadmbbl` `\DTLloadmbib{<mbib>}{<db name>}{<bib list>}`

```

\newcommand*{\DTLloadmbbl}[3]{%
\@ifundefined{dtl@aux@#1}{%
    \PackageError{datbib}{multibib ‘#1’ not defined}{%
        You need to define ‘#1’ in \string\DTLmutlibibs}%
    }{%
        \if@filesw
            \expandafter\immediate\expandafter
            \write\csname dtl@aux@#1\endcsname{\string\bibstyle{datbib}}%
        \fi
    }%
}

```

```

\expandafter\immediate\expandafter
\write\csname dtl@aux@#1\endcsname{\string\bibdata{#3}}%
\fi
\DTLnewdb{#2}%
\edef\DTLBIBdbname{#2}%
\@input@{#1.bbl}%
}%
}

```

`\DTLbibliography[<condition>]{<mbib name>}{<bib dbname>}`

Displays the bibliography for the database *<bib dbname>* which must have previously been loaded using `\DTLloadmbbl`, where *<mbib name>* must be listed in `\DTLmultibibs`.

`\DTLbibliography`

```

\newcommand*{\DTLbibliography}[3][\boolean{true}]{%
\begin{DTLthebibliography}[#1]{#3}%
\DTLforeachbibentry[#1]{#3}{%
\DTLmbibitem{#2} \DTLformatbibentry \DTLendbibitem
}%
\end{DTLthebibliography}%
}

```

6 databar.sty

Declare package:

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{databar}[2012/07/18 v2.10 (NLCT)]
```

Require xkeyval package

```
\RequirePackage{xkeyval}
```

Require dataplot package

```
\RequirePackage{dataplot}
```

`\ifDTLcolorbarchart` The conditional `\ifDTLcolorbarchart` is used to determine whether to use colour or grey scale.

```
\newif\ifDTLcolorbarchart
\DTLcolorbarcharttrue
```

Package options to change the conditional:

```
\DeclareOption{color}{\DTLcolorbarcharttrue}
\DeclareOption{gray}{\DTLcolorbarchartfalse}
```

`\DTLbarXlabelalign` specifies the alignment for the x axis labels.

```
\newcommand*{\DTLbarXlabelalign}{left,rotate=-90}
```

`\DTLbarYticklabelalign` specifies the alignment for the x axis labels.

```
\newcommand*{\DTLbarYticklabelalign}{right}
```

`\ifDTLverticalbars` Define boolean keys to govern bar chart orientation.

```
\define@boolkey{databar}[DTL]{verticalbars}[true]{%
\ifDTLverticalbars
\def\DTLbarXlabelalign{left,rotate=-90}%
\def\DTLbarYticklabelalign{right}
\else
\def\DTLbarXlabelalign{right}%
\def\DTLbarYticklabelalign{center}
\fi}
```

Set defaults:

```
\DTLverticalbarstrue
```

Package options to change `\ifDTLverticalbars`

```
\DeclareOption{vertical}{\DTLverticalbarstrue}
\def\DTLbarXlabelalign{left,rotate=-90}%
\def\DTLbarYticklabelalign{right}
```

```

}
\DeclareOption{horizontal}{\DTLverticalbarsfalse
\def\DTLbarXlabelalign{right}%
\def\DTLbarYticklabelalign{center}
}

```

Process options:

```
\ProcessOptions
```

Required packages:

```

\RequirePackage{datatool}
\RequirePackage{tikz}

```

Define some variables that govern the appearance of the bar chart.

<code>\DTLbarchartlength</code>	The total height of the bar chart is given by <code>\DTLbarchartheight</code> <code>\newlength\DTLbarchartlength</code> <code>\DTLbarchartlength=3in</code>
<code>\DTLbarwidth</code>	The width of each bar is given by <code>\DTLbarwidth</code> . <code>\newlength\DTLbarwidth</code> <code>\DTLbarwidth=1cm</code>
<code>\DTLbarlabeloffset</code>	The offset from the x axis to the bar label if given by <code>\DTLbarlabeloffset</code> . <code>\newlength\DTLbarlabeloffset</code> <code>\setlength\DTLbarlabeloffset{10pt}</code>
<code>\DTLBarXAxisStyle</code>	The style of the x axis is given by <code>\DTLBarXAxisStyle</code> <code>\newcommand*\DTLBarXAxisStyle{-}</code>
<code>\DTLBarYAxisStyle</code>	The style of the y axis is given by <code>\DTLBarYAxisStyle</code> . <code>\newcommand*\DTLBarYAxisStyle{-}</code>
<code>DTLbarroundvar</code>	<code>DTLbarroundvar</code> is a counter governing the number of digits to round to when using <code>\FPround</code> . <code>\newcounter{DTLbarroundvar}</code> <code>\setcounter{DTLbarroundvar}{1}</code>
<code>\DTLbardisplayYticklabel</code>	<code>\DTLbardisplayYticklabel</code> governs how the y tick labels appear. <code>\newcommand*\DTLbardisplayYticklabel[1]{#1}</code>
<code>\DTLdisplaylowerbarlabel</code>	<code>\DTLdisplaylowerbarlabel</code> governs how the lower bar labels appear. <code>\newcommand*\DTLdisplaylowerbarlabel[1]{#1}</code>
<code>\DTLdisplaylowermultibarlabel</code>	<code>\DTLdisplaylowermultibarlabel</code> governs how the lower multi bar labels appear. <code>\newcommand*\DTLdisplaylowermultibarlabel[1]{#1}</code>

<code>\displayupperbarlabel</code>	<p><code>\DTLdisplayupperbarlabel</code> governs how the upper bar labels appear.</p> <pre>\newcommand*{\DTLdisplayupperbarlabel}[1]{#1}</pre>
<code>\displayuppermultibarlabel</code>	<p><code>\DTLdisplayuppermultibarlabel</code> governs how the upper multi bar labels appear.</p> <pre>\newcommand*{\DTLdisplayuppermultibarlabel}[1]{#1}</pre>
<code>\DTLbaratbegintikz</code>	<p><code>\DTLbaratbegintikz</code> specifies any commands to apply at the start of the <code>tikzpicture</code> environment. By default it does nothing.</p> <pre>\newcommand*{\DTLbaratbegintikz}{}</pre>
<code>\DTLbaratendtikz</code>	<p><code>\DTLbaratendtikz</code> specifies any commands to apply at the end of the <code>tikzpicture</code> environment. By default it does nothing.</p> <pre>\newcommand*{\DTLbaratendtikz}{}</pre>
<code>\ifDTLbarxaxis</code>	<p>The conditional <code>\ifDTLbarxaxis</code> is used to determine whether or not to display the x axis</p> <pre>\newif\ifDTLbarxaxis</pre>
<code>\ifDTLbaryaxis</code>	<p>The conditional <code>\ifDTLbaryaxis</code> is used to determine whether or not to display the y axis.</p> <pre>\newif\ifDTLbaryaxis</pre>
<code>\ifDTLbarytics</code>	<p>The conditional <code>\ifDTLbarytics</code> to determine whether or not to display the tick marks.</p> <pre>\newif\ifDTLbarytics</pre>
<code>\@dtl@barcount</code>	<p>The count register <code>\@dtl@barcount</code> is used to store the current bar index.</p> <pre>\newcount\@dtl@barcount</pre>
<code>\DTLsetbarcolor</code>	<div style="border: 1px solid black; background-color: #ffffcc; padding: 5px;"> <pre>\DTLsetbarcolor{<n>}{<color>}</pre> </div> <p>Assigns colour name <code><color></code> to the <code><n></code>th bar.</p> <pre>\newcommand*{\DTLsetbarcolor}[2]{% \expandafter\def\csname dtlbar@segcol\romannumeral#1\endcsname{#2}% }</pre>
<code>\DTLgetbarcolor</code>	<div style="border: 1px solid black; background-color: #ffffcc; padding: 5px;"> <pre>\DTLgetbarcolor{<n>}</pre> </div> <p>Gets the colour specification for the <code><n></code>th bar.</p> <pre>\newcommand*{\DTLgetbarcolor}[1]{% \csname dtlbar@segcol\romannumeral#1\endcsname}</pre>

`\DTLdobarcolor` `\DTLdobarcolor{<n>}`

Sets the colour to that for the <n>th bar.

```
\newcommand*{\DTLdobarcolor}[1]{%
\expandafter\color\expandafter
{\csname dtlbar@segcol\romannumeral#1\endcsname}}
```

`\DTLdocurrentbarcolor` `\DTLdocurrentbarcolor` sets the colour to that of the current bar.

```
\newcommand*{\DTLdocurrentbarcolor}{%
\ifnum\dtlforeachlevel=0\relax
\PackageError{databar}{Can't use
\string\DTLdocurrentbarcolor\space outside
\string\DTLbarchart}{}%
\else
\expandafter\DTLdobarcolor\expandafter{%
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname}%
\fi}
```

`\DTLbaroutlinecolor` `\DTLbaroutlinecolor` specifies what colour to draw the outline.

```
\newcommand*{\DTLbaroutlinecolor}{black}
```

`\DTLbaroutlinewidth` `\DTLbaroutlinewidth` specifies the line width of the outline: Outline is only drawn if the linewidth is greater than 0pt.

```
\newlength\DTLbaroutlinewidth
\DTLbaroutlinewidth=0pt
```

Set the default colours. If there are more than eight bars, more colours will need to be defined.

```
\ifDTLcolorbarchart
\DTLsetbarcolor{1}{red}
\DTLsetbarcolor{2}{green}
\DTLsetbarcolor{3}{blue}
\DTLsetbarcolor{4}{yellow}
\DTLsetbarcolor{5}{magenta}
\DTLsetbarcolor{6}{cyan}
\DTLsetbarcolor{7}{orange}
\DTLsetbarcolor{8}{white}
\else
\DTLsetbarcolor{1}{black!15}
\DTLsetbarcolor{2}{black!25}
\DTLsetbarcolor{3}{black!35}
\DTLsetbarcolor{4}{black!45}
\DTLsetbarcolor{5}{black!55}
\DTLsetbarcolor{6}{black!65}
\DTLsetbarcolor{7}{black!75}
\DTLsetbarcolor{8}{black!85}
\fi
```


`\DTLeverybarhook` Code to apply at every bar. The start point of the bar can be accessed via `\DTLstartpt`, the mid point of the bar can be accessed via `\DTLmidpt` and the end point of the bar can be accessed via `\DTLendpt`

```
\newcommand*{\DTLeverybarhook}{}

```

Define keys for `\DTLbarchart` optional argument. Set the maximum value of the y axis.

```
\define@key{databar}{max}{\def\DTLbarmax{#1}}

```

Set the total length of the bar chart

```
\define@key{databar}{length}{\DTLbarchartlength=#1\relax}

```

Set the maximum depth (negative extent)

```
\define@key{databar}{maxdepth}{%
\ifnum#1>0\relax
\PackageError{databar}{depth must be zero or negative}{}%
\else
\def\DTLnegextent{#1}%
\fi}

```

Determine which axes should be shown

```
\define@choicekey{databar}{axes}[\var\nr]{both,x,y,none}{%
\ifcase\nr\relax
% both
\DTLbarxaxistrue
\DTLbaryaxistrue
\DTLbaryticstrue
\or
% x only
\DTLbarxaxistrue
\DTLbaryaxisfalse
\DTLbaryticsfalse
\or
% y only
\DTLbarxaxisfalse
\DTLbaryaxistrue
\DTLbaryticstrue
\or
% neither
\DTLbarxaxisfalse
\DTLbaryaxisfalse
\DTLbaryticsfalse
\fi}

```

Variable used to create the bar chart. (Must be a control sequence.)

```
\define@key{databar}{variable}{%
\def\DTLbarvariable{#1}%
}

```

Variables used to create the multi bar chart. (Must be a comma separated list of control sequences.)

```
\define@key{databar}{variables}{%
\def\dtlbar@variables{#1}%
}
```

Bar width

```
\define@key{databar}{barwidth}{\setlength{DTLbarwidth}{#1}}
```

Lower bar labels

```
\define@key{databar}{barlabel}{%
\def\dtl@barlabel{#1}}
\def\dtl@barlabel{}
```

Lower bar labels for multi-bar charts

```
\define@key{databar}{multibarlabels}{%
\def\dtl@multibarlabels{#1}}
\def\dtl@multibarlabels{}
```

Gap between groups in multi-bar charts (This should be in x units where 1 x unit is the width of a bar.)

```
\define@key{databar}{groupgap}{\def\dtlbar@groupgap{#1}}
\def\dtlbar@groupgap{1}
```

Upper bar labels

```
\define@key{databar}{upperbarlabel}{%
\def\dtl@upperbarlabel{#1}}
\def\dtl@upperbarlabel{}
```

Upper bar labels for multi-bar charts

```
\define@key{databar}{uppermultibarlabels}{%
\def\dtl@uppermultibarlabels{#1}}
\def\dtl@uppermultibarlabels{}
```

Define list of points for y tics. (Must be a comma separated list of decimal numbers.)

```
\define@key{databar}{yticpoints}{%
\def\dtlbar@yticlist{#1}\DTLbaryticstrue\DTLbaryaxistrue}
\let\dtlbar@yticlist=\relax
```

Set the y tick gap:

```
\define@key{databar}{yticgap}{%
\def\dtlbar@yticgap{#1}\DTLbaryticstrue\DTLbaryaxistrue}
\let\dtlbar@yticgap=\relax
```

Define list of labels for y tics.

```
\define@key{databar}{yticlabels}{%
\def\dtlbar@yticlabels{#1}\DTLbaryticstrue\DTLbaryaxistrue}
\let\dtlbar@yticlabels=\relax
```

Define y axis label.

```
\define@key{databar}{ylabel}{%
\def\dtlbar@ylabel{#1}}
\let\dtlbar@ylabel=\relax
```

`\DTLbarchart` `\DTLbarchart [<conditions>] {<option list>} {<db name>} {<assign list>}`

Make a bar chart from data given in data base *<db name>*, where *<assign list>* is a comma-separated list of *<cmd>=<key>* pairs. *<option list>* must include *variable=<cmd>*, where *<cmd>* is included in *<assign list>*. The optional argument *<conditions>* is the same as that for `\DTLforeach`.

```
\newcommand*{\DTLbarchart}[4][\boolean{true}]{%
{%
  \undef\DTLbarvariable
  \undef\DTLbarmax
  \undef\DTLnegextent
  \disable@keys{databar}{variables,multibarlabels,%
    uppermultibarlabels,groupgap}%
  \setkeys{databar}{#2}%
  \ifundef{\DTLbarvariable}%
  {%
    \PackageError{databar}%
    {\string\DTLbarchart\space missing variable}%
    {You haven't use the "variable" key}%
  }%
}%
```

Compute the maximum bar height, unless `\DTLbarmax` has been set.

```
\ifundef{\DTLbarmax}%
{%
  \@sDTLforeach[#1]{#3}{#4}{%
    \expandafter\DTLconverttodecimal\expandafter
    {\DTLbarvariable}{\dtl@barvar}%
    \ifundef{\DTLbarmax}%
    {%
      \let\DTLbarmax=\dtl@barvar
    }%
    {%
      \let\dtl@old=\DTLbarmax
      \dtlmax{\DTLbarmax}{\dtl@old}{\dtl@barvar}%
    }%
  }%
  \ifx\dtlbar@yticgap\relax
  \else
    \let\dtl@thistick=\dtlbar@yticgap
    \whiledo{\DTLisFPopenbetween{\dtl@thistick}{0}{\DTLbarmax}}{%
      {%
        \dtladd{\dtl@thistick}{\dtl@thistick}{\dtlbar@yticgap}%
      }%
      \let\DTLbarmax=\dtl@thistick
    }%
  \fi
}%
}%
```

Compute the bar depth, unless \DTLnegextent has been set.

```
\ifundef{\DTLnegextent}%
{%
  \def\DTLnegextent{0}%
  \@sDTLforeach[#1]{#3}{#4}{%
    \expandafter\DTLconverttodecimal\expandafter
      {\DTLbarvariable}{\dtl@barvar}%
    \let\dtl@old=\DTLnegextent
    \DTLmin{\DTLnegextent}{\dtl@old}{\dtl@barvar}%
  }%
  \ifx\dtlbar@yticgap\relax
  \else
    \ifthenelse{\DTLisFPInt{\DTLnegextent}{0}}{%
      {%
        \edef\dtl@thistick{0}%
        \whiledo{\DTLisFPclosedbetween{\dtl@thistick}{\DTLnegextent}{0}}{%
          \dtlsub{\dtl@thistick}{\dtl@thistick}{\dtlbar@yticgap}%
        }%
        \let\DTLnegextent=\dtl@thistick
      }{%
    }%
  \fi
}%
}%
```

Determine scaling factor

```
\@dtl@tmpcount=\DTLbarchartlength
\dtlsub{\dtl@extent}{\DTLbarmax}{\DTLnegextent}%
\dtldiv{\dtl@unit}{\number\@dtl@tmpcount}{\dtl@extent}%
```

Construct y tick list if required

```
\setlength{\dtl@yticlabelwidth}{0pt}%
\ifDTLbarytics
  \ifx\dtlbar@yticlist\relax
    \ifx\dtlbar@yticgap\relax
      \dtl@constructticklist\DTLnegextent\DTLbarmax
      \dtl@unit\dtlbar@yticlist
    \else
      \dtl@constructticklistwithgapz
      \DTLnegextent\DTLbarmax\dtlbar@yticlist\dtlbar@yticgap
    \fi
  \fi
  \ifx\dtlbar@ylabel\relax
  \else
    \ifx\dtlbar@yticlabels\relax
      \@for\dtl@thislabel:=\dtlbar@yticlist\do{%
        \dtlround{\dtl@thislabel}{\dtl@thislabel}
        {\c@DTLbarroundvar}%
      }
    \ifDTLverticalbars
      \settowidth{\dtl@tmplength}{%
        \DTLbardisplayYticklabel{\dtl@thislabel}}%
    \fi
  \fi
\fi
```

```

\else
  \settoheight{\dtl@tmplength}{%
    \DTLbardisplayYticklabel{\dtl@thislabel}}%
  \edef\@dtl@h{\the\dtl@tmplength}%
  \settodepth{\dtl@tmplength}{%
    \DTLbardisplayYticklabel{\dtl@thislabel}}%
  \addtolength{\dtl@tmplength}{\@dtl@h}%
  \addtolength{\dtl@tmplength}{\baselineskip}%
\fi
\ifdim\dtl@tmplength>\dtl@yticlabelwidth
  \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
\fi
}%
\else
  \@for\dtl@thislabel:=\dtlbar@yticlabels\do{%
    \ifDTLverticalbars
      \settowidth{\dtl@tmplength}{%
        \DTLbardisplayYticklabel{\dtl@thislabel}}%
    \else
      \settoheight{\dtl@tmplength}{%
        \DTLbardisplayYticklabel{\dtl@thislabel}}%
      \edef\@dtl@h{\the\dtl@tmplength}%
      \settodepth{\dtl@tmplength}{%
        \DTLbardisplayYticklabel{\dtl@thislabel}}%
      \addtolength{\dtl@tmplength}{\@dtl@h}%
      \addtolength{\dtl@tmplength}{\baselineskip}%
    \fi
    \ifdim\dtl@tmplength>\dtl@yticlabelwidth
      \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
    \fi
  }%
\fi
\fi
\fi

```

Store the width of the bar chart in \DTLbarchartwidth

```
\edef\DTLbarchartwidth{\expandafter\number\csname dtlrows@#3\endcsname}
```

Do the bar chart

```
\begin{tikzpicture}
```

Set unit vectors

```

\ifDTLverticalbars
  \pgfsetyvec{\pgfpoint{0pt}{\dtl@unit sp}}%
  \pgfsetxvec{\pgfpoint{\DTLbarwidth}{0pt}}%
\else
  \pgfsetxvec{\pgfpoint{\dtl@unit sp}{0pt}}%
  \pgfsetyvec{\pgfpoint{0pt}{\DTLbarwidth}}%
\fi

```

Begin hook

```

\DTLbaratbegin tikz
Initialise
\def\@dtl@start{0}%
Iterate through data
\@sDTLforeach[#1]{#3}{#4}{%
Store the bar number in \@dtl@bar
\expandafter\let\expandafter\@dtl@bar
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname%
Convert variable to decimal
\expandafter\DTLconverttodecimal\expandafter
{\DTLbarvariable}{\dtl@variable}%
Draw bars
\begin{scope}
\DTLdocurrentbarcolor
\ifDTLverticalbars
\fill (\@dtl@start,0) -- (\@dtl@start,\dtl@variable)
-- (\@dtl@bar,\dtl@variable) -- (\@dtl@bar,0) -- cycle;
\else
\fill (0,\@dtl@start) -- (\dtl@variable,\@dtl@start)
-- (\dtl@variable,\@dtl@bar) -- (0,\@dtl@bar) -- cycle;
\fi
\end{scope}
Draw outline
\begin{scope}
\ifdim\DTLbaroutlinewidth>0pt
\expandafter\color\expandafter{\DTLbaroutlinecolor}
\ifDTLverticalbars
\draw (\@dtl@start,0) -- (\@dtl@start,\dtl@variable)
-- (\@dtl@bar,\dtl@variable) -- (\@dtl@bar,0) -- cycle;
\else
\draw (0,\@dtl@start) -- (\dtl@variable,\@dtl@start)
-- (\dtl@variable,\@dtl@bar) -- (0,\@dtl@bar) -- cycle;
\fi
\fi
\end{scope}
Draw lower x labels
\ifDTLverticalbars
\edef\dtl@textopt{%
at={\noexpand\pgfpointadd
{\noexpand\pgfpointxy{\@dtl@start.5}{0}}
{\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}},
\DTLbarXlabelalign
}%
Set \DTLstartpt to the starting point.

```

```

\edef\DTLstartpt{\noexpand\pgfpointxy{\@dtl@start.5}{0}}%
\else
\edef\dtl@textopt{%
  at={\noexpand\pgfpointadd
    {\noexpand\pgfpointxy{0}{\@dtl@start.5}}
    {\noexpand\pgfpoint{-\noexpand\DTLbarlabeloffset}{0pt}}},
  \DTLbarXlabelalign
}%

```

Set \DTLstartpt to the starting point.

```

\edef\DTLstartpt{\noexpand\pgfpointxy{0}{\@dtl@start.5}}%
\fi
\expandafter\pgftext\expandafter[\dtl@textopt]{%
  \DTLdisplaylowerbarlabel{\dtl@barlabel}}

```

Draw upper x labels

```

\ifDTLverticalbars

```

Vertical bars

```

\expandafter\DTLifnumlt\expandafter{\DTLbarvariable}{0}%
{
  \edef\dtl@textopt{%
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{\@dtl@start.5}{\dtl@variable}}
      {\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}}
  }%
}{%
  \edef\dtl@textopt{%
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{\@dtl@start.5}{\dtl@variable}}
      {\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}}
  }%
}

```

Set \DTLendpt to the end point.

```

\edef\DTLendpt{\noexpand\pgfpointxy{\@dtl@start.5}{\dtl@variable}}%
\else

```

Horizontal bars

```

\expandafter\DTLifnumlt\expandafter{\DTLbarvariable}{0}%
{
  \edef\dtl@textopt{right,
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{\dtl@variable}{\@dtl@start.5}}
      {\noexpand\pgfpoint{-\noexpand\DTLbarlabeloffset}{0pt}}}
  }%
}{%
  \edef\dtl@textopt{left,
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{\dtl@variable}{\@dtl@start.5}}
      {\noexpand\pgfpoint{\noexpand\DTLbarlabeloffset}{0pt}}}
  }%
}

```

```

    }%
  }
Set \DTLendpt to the end point.
    \edef\DTLendpt{\noexpand\pgfpointxy{\dtl@variable}{\@dtl@start.5}}%
\fi
    \expandafter\pgftext\expandafter[\dtl@textopt]{%
        \DTLdisplayupperbarlabel{\dtl@upperbarlabel}}
Set the mid point
    \def\DTLmidpt{\pgfpointlineattime{0.5}{\DTLstartpt}{\DTLendpt}}%
Do every bar hook
    \DTLeverybarhook
End of loop
    \edef\@dtl@start{\number\@dtl@bar}%
}%
Draw x axis
    \ifDTLbarxaxis
        \ifDTLverticalbars
            \expandafter\draw\expandafter[\DTLBarXAxisStyle]
                (0,0) -- (\DTLbarchartwidth,0);
        \else
            \expandafter\draw\expandafter[\DTLBarXAxisStyle]
                (0,0) -- (0,\DTLbarchartwidth);
        \fi
    \fi
Draw y axis
    \ifDTLbaryaxis
        \ifDTLverticalbars
            \expandafter\draw\expandafter[\DTLBarYAxisStyle]
                (0,\DTLnegextent) -- (0,\DTLbarmax);
        \else
            \expandafter\draw\expandafter[\DTLBarYAxisStyle]
                (\DTLnegextent,0) -- (\DTLbarmax,0);
        \fi
    \fi
Plot y tick marks if required
    \ifx\dtlbar@yticlist\relax
    \else
        \@for\dtl@thistick:=\dtlbar@yticlist\do{%
            \ifDTLverticalbars
                \pgfpathmoveto{\pgfpointxy{0}{\dtl@thistick}}
                \pgfpathlineto{
                    \pgfpointadd{\pgfpointxy{0}{\dtl@thistick}}
                        {\pgfpoint{-\DTLticklength}{0pt}}}
            \else
                \pgfpathmoveto{\pgfpointxy{\dtl@thistick}{0}}

```



```

\pgfpathlineto{
  \pgfpointadd{\pgfpointxy{\dtl@thistick}{0}}
    {\pgfpoint{0pt}{-\DTLticklength}}}
\fi
\pgfusepath{stroke}
\ifx\dtlbar@yticlabels\relax
  \dtlround{\dtl@thislabel}{\dtl@thistick}
    {\c@DTLbarroundvar}%
\else
  \dtl@chopfirst\dtlbar@yticlabels\dtl@thislabel\dtl@rest
  \let\dtlbar@yticlabels=\dtl@rest
\fi
\ifDTLverticalbars
  \edef\dtl@textopt{\DTLbarYticklabelalign,%
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{0}{\dtl@thistick}}
      {\noexpand\pgfpoint{-\noexpand\DTLticklabeloffset}{0pt}},
    }}%
\else
  \edef\dtl@textopt{\DTLbarYticklabelalign,
    at={\noexpand\pgfpointadd
      {\noexpand\pgfpointxy{\dtl@thistick}{0}}
      {\noexpand\pgfpoint{0pt}{-\noexpand\DTLticklabeloffset}}}
    }}%
\fi
\expandafter\pgftext\expandafter[\dtl@textopt]{%
  \DTLbardisplayYticklabel{\dtl@thislabel}}
}%
\fi

```

Plot the y label if required

```

\ifx\dtlbar@ylabel\relax
\else
  \addtolength{\dtl@yticlabelwidth}{\baselineskip}%
  \setlength{\dtl@tmplength}{0.5\DTLbarchartlength}
  \ifDTLverticalbars
    \pgftext[bottom,center,at={\pgfpointadd
      {\pgfpointxy{0}{\DTLnegextent}}}%
      {\pgfpoint{-\dtl@yticlabelwidth}{\dtl@tmplength}}},
      rotate=90]{%
      \dtlbar@ylabel}
  \else
    \pgftext[bottom,center,at={\pgfpointadd
      {\pgfpointxy{\DTLnegextent}{0}}}%
      {\pgfpoint{\dtl@tmplength}{-\dtl@yticlabelwidth}}}{%
      \dtlbar@ylabel}
  \fi
\fi

```

Finish bar chart

```

\DTLbaratendtikz
\end{tikzpicture}
}%
}%
}

```

\DTLmultibarchart

```

\DTLmultibarchart[<conditions>]{<option list>}{<db name>}{<assign
list>}

```

Make a multi-bar chart from data given in data base *<db name>*, where *<assign list>* is a comma-separated list of *<cmd>=<key>* pairs. *<option list>* must include the variables key which must be a comma separated list of commands, where each command is included in *<assign list>*. The optional argument *<conditions>* is the same as that for \DTLforeach.

```

\newcommand*{\DTLmultibarchart}[4][\boolean{true}]{%
{\let\dtlbar@variables=\relax
\let\DTLbarmax=\relax
\let\DTLnegextent=\relax
\disable@keys{databar}{variable,upperbarlabel}%
\setkeys{databar}{#2}%
\ifx\dtlbar@variables\relax
\PackageError{databar}{\string\DTLmultibarchart\space missing variables setting}{}%
\else

```

Compute the maximum bar height, unless \DTLbarmax has been set.

```

\ifx\DTLbarmax\relax
\@sDTLforeach[#1]{#3}{#4}{%
\@for\DTLbarvariable:=\dtlbar@variables\do{%
\expandafter\DTLconverttodecimal\expandafter
{\DTLbarvariable}{\dtl@barvar}%
\ifx\DTLbarmax\relax
\let\DTLbarmax=\dtl@barvar
\else
\let\dtl@old=\DTLbarmax
\dtlmax{\DTLbarmax}{\dtl@old}{\dtl@barvar}%
\fi
}%
}%
\ifx\dtlbar@yticgap\relax
\else
\let\dtl@thistick=\dtlbar@yticgap%
\whiledo{\DTLisFPopenbetween{\dtl@thistick}{0}{\DTLbarmax}}{%
\dtladd{\dtl@thistick}{\dtl@thistick}{\dtlbar@yticgap}%
}%
\let\DTLbarmax=\dtl@thistick
\fi
\fi

```

Compute the bar depth, unless \DTLnegextent has been set.

```
\ifx\DTLnegextent\relax
\def\DTLnegextent{0}%
\@sDTLforeach[#1]{#3}{#4}{%
\@for\DTLbarvariable:=\dtlbar@variables\do{%
\expandafter\DTLconverttodecimal\expandafter
{\DTLbarvariable}{\dtl@barvar}%
\let\dtl@old=\DTLnegextent
\DTLmin{\DTLnegextent}{\dtl@old}{\dtl@barvar}%
}%
}%
\ifx\dtlbar@yticgap\relax
\else
\ifthenelse{\DTLisFPgt{\DTLnegextent}{0}}{%
\edef\dtl@thistick{0}%
\whiledo{\DTLisFPclosedbetween{\dtl@thistick}{\DTLnegextent}{0}}{%
\dtlsub{\dtl@thistick}{\dtl@thistick}{\dtlbar@yticgap}%
}%
\let\DTLnegextent=\dtl@thistick
}%}%
\fi
\fi
```

Determine scaling factor

```
\@dtl@tmpcount=\DTLbarchartlength
\dtlsub{\dtl@extent}{\DTLbarmax}{\DTLnegextent}%
\dtldiv{\dtl@unit}{\number\@dtl@tmpcount}{\dtl@extent}%
```

Construct y tick list if required

```
\setlength{\dtl@yticlabelwidth}{0pt}%
\ifDTLbarytics
\ifx\dtlbar@yticlist\relax
\ifx\dtlbar@yticgap\relax
\dtl@constructticklist\DTLnegextent\DTLbarmax
\dtl@unit\dtlbar@yticlist
\else
\dtl@constructticklistwithgapz
\DTLnegextent\DTLbarmax\dtlbar@yticlist\dtlbar@yticgap
\fi
\fi
\ifx\dtlbar@ylabel\relax
\else
\ifx\dtlbar@yticlabels\relax
\@for\dtl@thislabel:=\dtlbar@yticlist\do{%
\dtlround{\dtl@thislabel}{\dtl@thislabel}
{\c@DTLbarroundvar}%
\ifDTLverticalbars
\settowidth{\dtl@tmplength}{%
\DTLbardisplayYticklabel{\dtl@thislabel}}%
\else
```

```

\settoheight{\dtl@tmplength}{%
  \DTLbardisplayYticklabel{\dtl@thislabel}}%
\edef\@dtl@h{\the\dtl@tmplength}%
\settodepth{\dtl@tmplength}{%
  \DTLbardisplayYticklabel{\dtl@thislabel}}%
\addtolength{\dtl@tmplength}{\@dtl@h}%
\addtolength{\dtl@tmplength}{\baselineskip}%
\fi
\ifdim\dtl@tmplength>\dtl@yticlabelwidth
  \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
\fi
}%
\else
\@for\dtl@thislabel:=\dtlbar@yticlabels\do{%
  \ifDTLverticalbars
    \settowidth{\dtl@tmplength}{%
      \DTLbardisplayYticklabel{\dtl@thislabel}}%
  \else
    \settoheight{\dtl@tmplength}{%
      \DTLbardisplayYticklabel{\dtl@thislabel}}%
    \edef\@dtl@h{\the\dtl@tmplength}%
    \settodepth{\dtl@tmplength}{%
      \DTLbardisplayYticklabel{\dtl@thislabel}}%
    \addtolength{\dtl@tmplength}{\@dtl@h}%
    \addtolength{\dtl@tmplength}{\baselineskip}%
  \fi
  \ifdim\dtl@tmplength>\dtl@yticlabelwidth
    \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
  \fi
}%
\fi
\fi

```

Calculate the offset for the lower label and number of labels

```

\dtl@xticlabelheight=0pt\relax
\@dtl@tmpcount=0\relax
\@for\dtl@thislabel:=\dtl@multibarlabels\do{%
  \advance\@dtl@tmpcount by 1\relax
  \settoheight{\dtl@tmplength}{\tikz\expandafter\pgftext\expandafter
    [\DTLbarXlabelalign]{\DTLdisplaylowerbarlabel{\dtl@thislabel}};}%
  \edef\@dtl@h{\the\dtl@tmplength}%
  \settodepth{\dtl@tmplength}{\tikz\expandafter\pgftext\expandafter
    [\DTLbarXlabelalign]{\DTLdisplaylowerbarlabel{\dtl@thislabel}};}%
  \addtolength{\dtl@tmplength}{\@dtl@h}%
  \addtolength{\dtl@tmplength}{\baselineskip}%
  \ifdim\dtl@tmplength>\dtl@xticlabelheight
    \setlength{\dtl@xticlabelheight}{\dtl@tmplength}%
  \fi
}

```

Calculate number of bars per group

```
\@dtl@tmpcount=0\relax
\@for\dtl@this:=\dtlbar@variables\do{%
  \advance\@dtl@tmpcount by 1\relax
}%
\edef\DTLbargroupwidth{\number\@dtl@tmpcount}%
```

Compute the total width of the bar chart (in terms of the x unit vector.)

```
\edef\dtl@n{\expandafter\number\csname dtlrows@#3\endcsname}
\dtl@mul{\dtl@tmpi}{\dtl@n}{\DTLbargroupwidth}
\dtl@sub{\dtl@tmpii}{\dtl@n}{1}%
\dtl@mul{\dtl@tmpii}{\dtl@tmpii}{\dtlbar@groupgap}%
\dtl@add{\DTLbarchartwidth}{\dtl@tmpi}{\dtl@tmpii}
```

Do the bar chart

```
\begin{tikzpicture}
```

Set unit vectors

```
\ifDTLverticalbars
  \pgfsetyvec{\pgfpoint{0pt}{\dtl@unit sp}}%
  \pgfsetxvec{\pgfpoint{\DTLbarwidth}{0pt}}%
\else
  \pgfsetxvec{\pgfpoint{\dtl@unit sp}{0pt}}%
  \pgfsetyvec{\pgfpoint{0pt}{\DTLbarwidth}}%
\fi
```

Begin hook

```
\DTLbaratbegintikz
```

Initialise

```
\def\@dtl@start{0}%
```

Iterate through data

```
\@sDTLforeach[#1]{#3}{#4}{%
```

Store the bar number in \@dtl@bar

```
\@dtl@barcount = 1\relax
```

Set the multibar label lists

```
\let\dtl@multibar@labels=\dtl@multibarlabels
\let\dtl@uppermultibar@labels=\dtl@uppermultibarlabels
```

Compute mid point over group

```
\dtl@mul{\dtl@multimidpt}{\DTLbargroupwidth}{0.5}%
\dtl@add{\dtl@multimidpt}{\dtl@multimidpt}{\@dtl@start}%
```

Iterate through each variable

```
\@for\DTLbarvariable:=\dtlbar@variables\do{%
```

Set end point

```
\dtl@add{\@dtl@endpt}{\@dtl@start}{1}%
```

Convert variable to decimal

```
\expandafter\DTLconverttodecimal\expandafter
{\DTLbarvariable}{\dtl@variable}%
```

Get the current lower label:

```
\dtl@chopfirst\dtl@multibar@labels\dtl@thisbarlabel\dtl@rest
\let\dtl@multibar@labels=\dtl@rest
```

Get the current upper label:

```
\dtl@chopfirst\dtl@uppermultibar@labels\dtl@thisupperbarlabel\dtl@rest
\let\dtl@uppermultibar@labels=\dtl@rest
```

Draw bars

```
\begin{scope}
\expandafter\color\expandafter{\DTLgetbarcolor{\@dtl@barcount}}%
\ifDTLverticalbars
\fill (\@dtl@start,0) -- (\@dtl@start,\dtl@variable)
-- (\@dtl@endpt,\dtl@variable) -- (\@dtl@endpt,0) -- cycle;
\else
\fill (0,\@dtl@start) -- (\dtl@variable,\@dtl@start)
-- (\dtl@variable,\@dtl@endpt) -- (0,\@dtl@endpt) -- cycle;
\fi
\end{scope}
```

Draw outline

```
\begin{scope}
\ifdim\DTLbaroutlinewidth>0pt
\expandafter\color\expandafter{\DTLbaroutlinecolor}
\ifDTLverticalbars
\draw (\@dtl@start,0) -- (\@dtl@start,\dtl@variable)
-- (\@dtl@endpt,\dtl@variable) -- (\@dtl@endpt,0) -- cycle;
\else
\draw (0,\@dtl@start) -- (\dtl@variable,\@dtl@start)
-- (\dtl@variable,\@dtl@endpt) -- (0,\@dtl@endpt) -- cycle;
\fi
\fi
\end{scope}
```

Calculate mid point

```
\dtladd{\@dtl@midpt}{\@dtl@start}{0.5}%
```

Draw lower x labels

```
\ifDTLverticalbars
\edef\dtl@textopt{%
at={\noexpand\pgfpointadd
{\noexpand\pgfpointxy{\@dtl@midpt}{0}}
{\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}},
\DTLbarXlabelalign
}%
\edef\DTLstartpt{\noexpand\pgfpointxy{\@dtl@midpt}{0}}%
\else
\edef\dtl@textopt{%
at={\noexpand\pgfpointadd
{\noexpand\pgfpointxy{0}{\@dtl@midpt}}
{\noexpand\pgfpoint{-\noexpand\DTLbarlabeloffset}{0pt}}},
```

```

        \DTLbarXlabelalign
    }%
    \edef\DTLstartpt{\noexpand\pgfpointxy{0}{\@dtl@midpt}}%
\fi
\expandafter\pgftext\expandafter[\dtl@textopt]{%
    \DTLdisplaylowermultibarlabel{\dtl@thisbarlabel}}

Draw upper x labels
\ifDTLverticalbars
\expandafter\DTLifnumlt\expandafter{\DTLbarvariable}{0}
{
    \edef\dtl@textopt{%
        at={\noexpand\pgfpointadd
            {\noexpand\pgfpointxy{\@dtl@midpt}{\dtl@variable}}
            {\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}}
    }%
}
\edef\dtl@textopt{%
    at={\noexpand\pgfpointadd
        {\noexpand\pgfpointxy{\@dtl@midpt}{\dtl@variable}}
        {\noexpand\pgfpoint{0pt}{-\noexpand\DTLbarlabeloffset}}}
}%
}
\edef\DTLendpt{\noexpand\pgfpointxy{\@dtl@midpt}{\dtl@variable}}%
\else
\expandafter\DTLifnumlt\expandafter{\DTLbarvariable}{0}
{
    \edef\dtl@textopt{right,
        at={\noexpand\pgfpointadd
            {\noexpand\pgfpointxy{\dtl@variable}{\@dtl@midpt}}
            {\noexpand\pgfpoint{-\noexpand\DTLbarlabeloffset}{0pt}}}
    }%
}
\edef\dtl@textopt{left,
    at={\noexpand\pgfpointadd
        {\noexpand\pgfpointxy{\dtl@variable}{\@dtl@midpt}}
        {\noexpand\pgfpoint{\noexpand\DTLbarlabeloffset}{0pt}}}
}%
}
\edef\DTLendpt{\noexpand\pgfpointxy{\dtl@variable}{\@dtl@midpt}}%
\fi
\expandafter\pgftext\expandafter[\dtl@textopt]{%
    \DTLdisplayuppermultibarlabel{\dtl@thisupperbarlabel}}

```

Set the mid point

```
\def\DTLmidpt{\pgfpointlineattime{0.5}{\DTLstartpt}{\DTLendpt}}%
```

Do every bar hook

```
\DTLeverybarhook
```

End of loop increment loop variables

```

\dtladd{\@dtl@start}{\@dtl@start}{1}%
\advance\@dtl@barcount by 1\relax
}%
% Draw lower group $$ labels
% \begin{macrocode}
\setlength{\dtl@tmplength}{\DTLbarlabeloffset}%
\addtolength{\dtl@tmplength}{\dtl@xticlabelheight}%
\ifDTLverticalbars
\edef\dtl@textopt{%
  at={\noexpand\pgfpointadd
    {\noexpand\pgfpointxy{\dtl@multimidpt}{0}}
    {\noexpand\pgfpoint{0pt}{-\noexpand\dtl@tmplength}}},
  \DTLbarXlabelalign
}%
\else
\edef\dtl@textopt{%
  at={\noexpand\pgfpointadd
    {\noexpand\pgfpointxy{0}{\dtl@multimidpt}}
    {\noexpand\pgfpoint{-\noexpand\dtl@tmplength}{0pt}}},
  \DTLbarXlabelalign
}%
\fi
\expandafter\pgftext\expandafter[\dtl@textopt]{%
  \DTLdisplaylowerbarlabel{\dtl@barlabel}}
Increment starting position by \dtlbar@groupgap
\dtladd{\@dtl@start}{\@dtl@start}{\dtlbar@groupgap}%
}

Draw x axis
\ifDTLbarxaxis
\ifDTLverticalbars
\expandafter\draw\expandafter[\DTLBarXAxisStyle]
(0,0) -- (\DTLbarchartwidth,0);
\else
\expandafter\draw\expandafter[\DTLBarXAxisStyle]
(0,0) -- (0,\DTLbarchartwidth);
\fi
\fi

Draw y axis
\ifDTLbaryaxis
\ifDTLverticalbars
\expandafter\draw\expandafter[\DTLBarYAxisStyle]
(0,\DTLnegextent) -- (0,\DTLbarmax);
\else
\expandafter\draw\expandafter[\DTLBarYAxisStyle]
(\DTLnegextent,0) -- (\DTLbarmax,0);
\fi
\fi

```


Plot y tick marks if required

```

\ifx\dtlbar@yticlist\relax
\else
  \@for\dtl@thistick:=\dtlbar@yticlist\do{%
    \ifDTLverticalbars
      \pgfpathmoveto{\pgfpointxy{0}{\dtl@thistick}}
      \pgfpathlineto{
        \pgfpointadd{\pgfpointxy{0}{\dtl@thistick}}
          {\pgfpoint{-\DTLticklength}{0pt}}}
    \else
      \pgfpathmoveto{\pgfpointxy{\dtl@thistick}{0}}
      \pgfpathlineto{
        \pgfpointadd{\pgfpointxy{\dtl@thistick}{0}}
          {\pgfpoint{0pt}{-\DTLticklength}}}
    \fi
    \pgfusepath{stroke}
    \ifx\dtlbar@yticlabels\relax
      \dtlround{\dtl@thislabel}{\dtl@thistick}
      {\c@DTLbarroundvar}%
    \else
      \dtl@chopfirst\dtlbar@yticlabels\dtl@thislabel\dtl@rest
      \let\dtlbar@yticlabels=\dtl@rest
    \fi
    \ifDTLverticalbars
      \edef\dtl@textopt{\DTLbarYticklabelalign,%
        at={\noexpand\pgfpointadd
          {\noexpand\pgfpointxy{0}{\dtl@thistick}}
          {\noexpand\pgfpoint{-\noexpand\DTLticklabeloffset}{0pt}}},
        }%
    \else
      \edef\dtl@textopt{\DTLbarYticklabelalign,
        at={\noexpand\pgfpointadd
          {\noexpand\pgfpointxy{\dtl@thistick}{0}}
          {\noexpand\pgfpoint{0pt}{-\noexpand\DTLticklabeloffset}}}
        }%
    \fi
    \expandafter\pgftext\expandafter[\dtl@textopt]{%
      \DTLbardisplayYticklabel{\dtl@thislabel}}
  }%
\fi

```

Plot the y label if required

```

\ifx\dtlbar@ylabel\relax
\else
  \addtolength{\dtl@yticlabelwidth}{\baselineskip}%
  \setlength{\dtl@tmplength}{0.5\DTLbarchartlength}
  \ifDTLverticalbars
    \pgftext[bottom,center,at={\pgfpointadd
      {\pgfpointxy{0}{\DTLnegextent}}}
      {\pgfpoint{-\dtl@yticlabelwidth}{\dtl@tmplength}}},

```

```

        rotate=90]{%
        \dtlbar@ylabel}
    \else
        \pgftext[bottom,center,at={\pgfpointadd
            {\pgfpointxy{\DTLnegextent}{0}}%
            {\pgfpoint{\dtl@tmplength}{-\dtl@yticlabelwidth}}]{%
        \dtlbar@ylabel}
    \fi
\fi
Finish bar chart
\DTLbaratendtikz
\end{tikzpicture}
\fi
}}
```

7 datapie.sty

Declare package:

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{datapie}[2012/07/18 v2.10 (NLCT)]
```

Require xkeyval package

`\RequirePackage{xkeyval}`

`\ifDTLcolorpiechart` The conditional `\ifDTLcolorpiechart` is to determine whether to use colour or grey scale.

```
\newif\ifDTLcolorpiechart
\DTLcolorpiecharttrue
```

Package options to change the conditional:

```
\DeclareOption{color}{\DTLcolorpiecharttrue}
\DeclareOption{gray}{\DTLcolorpiechartfalse}
```

`\ifDTLrotateinner` Define boolean keys to govern label rotations.

```
\define@boolkey{datapie}[DTL]{rotateinner}[true]{}
```

\ifDTLrotateouter

```
\define@boolkey{datapie}[DTL]{rotateouter}[true]{}

```

Set defaults:

```
\DTLrotateinnerfalse
\DTLrotateouterfalse
```

Package options to change \DTLrotateinner

```
\DeclareOption{rotateinner}{\DTLrotateinnertrue}
\DeclareOption{norotateinner}{\DTLrotateinnerfalse}
```

Package options to change \DTLrotateouter

```
\DeclareOption{rotateouter}{\DTLrotateoutertrue}
\DeclareOption{norotateouter}{\DTLrotateouterfalse}
```

Process options:

\ProcessOptions

Required packages:

```
\RequirePackage{datatool}
\RequirePackage{tikz}
```

Define some variables that govern the appearance of the pie chart.

<code>\DTLradius</code>	<p>The radius of the pie chart is given by <code>\DTLradius</code>.</p> <pre> \newlength\DTLradius \DTLradius=2cm </pre>
<code>\DTLinnerratio</code>	<p>The inner label offset ratio is given by <code>\DTLinnerratio</code></p> <pre> \newcommand*{\DTLinnerratio}{0.5} </pre>
<code>\DTLouterratio</code>	<p>The outer label offset ratio is given by <code>\DTLouterratio</code>.</p> <pre> \newcommand*{\DTLouterratio}{1.25} </pre>
<code>\DTLcutawayratio</code>	<p>The cutaway offset ratio is given by <code>\DTLcutawayratio</code>.</p> <pre> \newcommand*\DTLcutawayratio{0.2} </pre>
<code>\DTLstartangle</code>	<p>The angle of the first segment is given by <code>\DTLstartangle</code>.</p> <pre> \newcommand*{\DTLstartangle}{0} </pre>
<code>\dtl@inneroffset</code>	<pre> \newlength\dtl@inneroffset \dtl@inneroffset=\DTLinnerratio\DTLradius </pre>
<code>\dtl@outeroffset</code>	<pre> \newlength\dtl@outeroffset \dtl@outeroffset=\DTLouterratio\DTLradius </pre>
<code>\dtl@cutawayoffset</code>	<pre> \newlength\dtl@cutawayoffset \dtl@cutawayoffset=\DTLcutawayratio\DTLradius </pre>
<code>\dtl@piecutaways</code>	<p><code>\dtl@piecutaways</code> is a comma separated list of segments that need to be cut away from the pie chart.</p> <pre> \newcommand*{\dtl@piecutaways}{} </pre>
<code>\dtl@innerlabel</code>	<p><code>\dtl@innerlabel</code> specifies the label to appear inside the segment. By default this is the variable used to create the pie chart.</p> <pre> \def\dtl@innerlabel{\DTLpievariable}% </pre>
<code>\dtl@outerlabel</code>	<pre> \def\dtl@outerlabel{}% </pre>
<code>DTLpieroundvar</code>	<p><code>DTLpieroundvar</code> is a counter governing the number of digits to round to when using <code>\FPrround</code>.</p> <pre> \newcounter{DTLpieroundvar} \setcounter{DTLpieroundvar}{1} </pre>

DTLdisplayinnerlabel	<code>\DTLdisplayinnerlabel{<label>}</code>	<p>This is used to format the inner label. This just does the label by default.</p> <pre>\newcommand*{\DTLdisplayinnerlabel}[1]{#1}</pre>
DTLdisplayouterlabel	<code>\DTLdisplayouterlabel{<label>}</code>	<p>This is used to format the outer label. This just does the label by default.</p> <pre>\newcommand*{\DTLdisplayouterlabel}[1]{#1}</pre>
\DTLpiepercent	<p>\DTLpiepercent returns the percentage value of the current segment.</p> <pre>\newcommand*{\DTLpiepercent}{% \ifnum\dtlforeachlevel=0\relax \PackageError{datapie}{Can't use \string\DTLpiepercent\space outside \string\DTLpiechart}{}% \else \csname dtl@piepercent@\romannumeral\@dtl@seg\endcsname \fi}</pre>	
\DTLpieatbegintikz	<p>\DTLpieatbegintikz specifies any commands to apply at the start of the tikzpicture environment. By default it does nothing.</p> <pre>\newcommand*{\DTLpieatbegintikz}{}</pre>	
\DTLpieatendtikz	<p>\DTLpieatendtikz specifies any commands to apply at the end of the tikzpicture environment. By default it does nothing.</p> <pre>\newcommand*{\DTLpieatendtikz}{}</pre>	
TLsetpiesegmentcolor	<code>\DTLsetpiesegmentcolor{<n>}{<color>}</code>	<p>Assign colour name <color> to the <n>th segment.</p> <pre>\newcommand*{\DTLsetpiesegmentcolor}[2]{% \expandafter\def\csname dtlpie@segcol\romannumeral#1\endcsname{#2}% }</pre>
TLgetpiesegmentcolor	<code>\DTLgetpiesegmentcolor{<n>}</code>	<p>Get the colour specification for segment <n></p> <pre>\newcommand*{\DTLgetpiesegmentcolor}[1]{% \csname dtlpie@segcol\romannumeral#1\endcsname}</pre>

DTLdopiecolor

```
\DTLdopiecolor{<n>}
```

Set the colour to that for segment <n>

```
\newcommand*{\DTLdopiecolor}[1]{%
\expandafter\color\expandafter
{\csname dtlpie@segcol\romannumeral#1\endcsname}}
```

DTLdcurrentpiecolor

\DTLdcurrentpiecolor sets the colour to that of the current segment.

```
\newcommand*{\DTLdcurrentpiecolor}{%
\ifnum\dtlforeachlevel=0\relax
\PackageError{datapie}{Can't use
\string\DTLdcurrentpiecolor\space outside
\string\DTLpiechart}{}%
\else
\expandafter\DTLdopiecolor\expandafter{%
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname}%
\fi}
```

DTLpieoutlinecolor

\DTLpieoutlinecolor specifies what colour to draw the outline.

```
\newcommand*{\DTLpieoutlinecolor}{black}
```

DTLpieoutlinewidth

\DTLpieoutlinewidth specifies the line width of the outline: Outline is only drawn if the linewidth is greater than 0pt.

```
\newlength\DTLpieoutlinewidth
\DTLpieoutlinewidth=0pt
```

Set the default colours. If there are more than eight segments, more colours will need to be defined.

```
\ifDTLcolorpiechart
\DTLsetpiecolor{1}{red}
\DTLsetpiecolor{2}{green}
\DTLsetpiecolor{3}{blue}
\DTLsetpiecolor{4}{yellow}
\DTLsetpiecolor{5}{magenta}
\DTLsetpiecolor{6}{cyan}
\DTLsetpiecolor{7}{orange}
\DTLsetpiecolor{8}{white}
\else
\DTLsetpiecolor{1}{black!15}
\DTLsetpiecolor{2}{black!25}
\DTLsetpiecolor{3}{black!35}
\DTLsetpiecolor{4}{black!45}
\DTLsetpiecolor{5}{black!55}
\DTLsetpiecolor{6}{black!65}
\DTLsetpiecolor{7}{black!75}
\DTLsetpiecolor{8}{black!85}
\fi
```

Define keys for \DTLpiechart optional argument. Set the starting angle of the first segment.

```
\define@key{datapie}{start}{\def\DTLstartangle{#1}}
```

Set the radius of the pie chart (must be set prior to inneroffset and outeroffset keys.)

```
\define@key{datapie}{radius}{\DTLradius=#1\relax
\dtl@inneroffset=\DTLinnerratio\DTLradius
\dtl@outeroffset=\DTLouterratio\DTLradius
\dtl@cutawayoffset=\DTLcutawayratio\DTLradius}
```

Set the inner ratio.

```
\define@key{datapie}{innerratio}{%
\def\DTLinnerratio{#1}%
\dtl@inneroffset=\DTLinnerratio\DTLradius}
```

Set the outer ratio

```
\define@key{datapie}{outerratio}{%
\def\DTLouterratio{#1}%
\dtl@outeroffset=\DTLouterratio\DTLradius}
```

The cutaway offset ratio

```
\define@key{datapie}{cutawayratio}{%
\def\DTLcutawayratio{#1}%
\dtl@cutawayoffset=\DTLcutawayratio\DTLradius}
```

Set the inner offset as an absolute value (not dependent on the radius.)

```
\define@key{datapie}{inneroffset}{%
\dtl@inneroffset=#1}
```

Set the outer offset as an absolute value (not dependent on the radius.)

```
\define@key{datapie}{outeroffset}{%
\dtl@outeroffset=#1}
```

Set the cutaway offset as an absolute value (not dependent on the radius.)

```
\define@key{datapie}{cutawayoffset}{%
\dtl@cutawayoffset=#1}
```

List of cut away segments.

```
\define@key{datapie}{cutaway}{%
\renewcommand*{\dtl@piecutaways}{#1}}
```

Variable used to create the pie chart. (Must be a control sequence.)

```
\define@key{datapie}{variable}{%
\def\DTLpievariable{#1}}
```

Inner label

```
\define@key{datapie}{innerlabel}{%
\def\dtl@innerlabel{#1}}
```

Outer label

```
\define@key{datapie}{outerlabel}{%
\def\dtl@outerlabel{#1}}
```

<code>\DTLpiechart</code>	<code>\DTLpiechart[\langle conditions \rangle]{\langle option list \rangle}{\langle db name \rangle}{\langle assign list \rangle}</code>
---------------------------	--

Make a pie chart from data given in data base $\langle db name \rangle$, where $\langle assign list \rangle$ is a comma-separated list of $\langle cmd \rangle = \langle key \rangle$ pairs. $\langle option list \rangle$ must include $variable = \langle cmd \rangle$, where $\langle cmd \rangle$ is included in $\langle assign list \rangle$. The optional argument $\langle conditions \rangle$ is the same as that for `\DTLforeach`.

```
\newcommand*\DTLpiechart[4][\boolean{true}]{%
  {\let\DTLpievariable=\relax
  \setkeys{datapie}{#2}%
  \ifx\DTLpievariable\relax
    \PackageError{datapie}{\string\DTLpiechart\space missing variable}{}%
  \else
```

Compute the total.

```
\def\dtl@total{0}%
\@sDTLforeach[#1]{#3}{#4}{%
\let\dtl@oldtotal=\dtl@total
\expandafter\DTLconverttodecimal\expandafter
  {\DTLpievariable}{\dtl@variable}%
\FPadd{\dtl@total}{\dtl@variable}{\dtl@total}%
}%
```

Compute the angles

```
\expandafter\DTLconverttodecimal\expandafter
  {\DTLstartangle}{\@dtl@start}%
\@sDTLforeach[#1]{#3}{#4}{%
\expandafter\DTLconverttodecimal\expandafter
  {\DTLpievariable}{\dtl@variable}%
\dtl@computeangles{%
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname}{%
\dtl@variable}%
\expandafter\@dtl@seg\expandafter=
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname%
\FPmul{\dtl@tmp}{\dtl@variable}{100}%
\let\dtl@old=\dtl@tmp
\FPdiv{\dtl@tmp}{\dtl@old}{\dtl@total}%
\expandafter\FPround
\csname dtl@piepercent@\romannumeral\@dtl@seg\endcsname\dtl@tmp
\c@DTLpieroundvar
}%
```

Compute the offsets for each cut away segment

```
\@for\dtl@row:=\dtl@piecutaways\do{%
\expandafter\@dtl@set@off\dtl@row-\relax
}%
```

Set the starting angle

```
\let\dtl@start=\DTLstartangle
```

Do the pie chart


```

\begin{tikzpicture}
\DTLpieatbegintikz
\@sDTLforeach[#1]{#3}{#4}{%
Store the segment number in \@dtl@seg
\expandafter\@dtl@seg\expandafter=
\csname c@DTLrow\romannumeral\dtlforeachlevel\endcsname%
Set the start angle.
\edef\dtl@start{\csname dtl@sang@\romannumeral\@dtl@seg\endcsname}%
Set the extent
\edef\dtl@extent{\csname dtl@angle@\romannumeral\@dtl@seg\endcsname}%
Compute the end angle
\FPadd{\dtl@endangle}{\dtl@start}{\dtl@extent}%
Compute the shift.
\edef\dtl@angle{\csname dtl@cut@angle@\romannumeral\@dtl@seg\endcsname}%
\let\dtl@old=\dtl@angle
\dtl@truncatedecimal\dtl@angle
\ifnum\dtl@angle>180
\FPsub{\dtl@angle}{\dtl@old}{360}%
\dtl@truncatedecimal\dtl@angle
\fi
\edef\dtl@cutlen{%
\csname dtl@cut@len@\romannumeral\@dtl@seg\endcsname}
\edef\@dtl@shift{(\dtl@angle:\dtl@cutlen)}%
Compute the mid way angle.
\FPmul{\dtl@angle}{\dtl@extent}{0.5}%
\FPadd{\dtl@midangle}{\dtl@angle}{\dtl@start}%
Draw the segment.
\begin{scope}[shift={\@dtl@shift}]%
\dtl@truncatedecimal\dtl@start
\dtl@truncatedecimal\dtl@endangle
\fill[color=\DTLgetpiesegmentcolor\@dtl@seg] (0,0) --
(\dtl@start:\DTLradius)
arc (\dtl@start:\dtl@endangle:\DTLradius) -- cycle;
Draw the outline if required:
\ifdim\DTLpieoutlinewidth>0pt\relax
\draw[color=\DTLpieoutlinecolor,line width=\DTLpieoutlinewidth]
(0,0) -- (\dtl@start:\DTLradius)
arc (\dtl@start:\dtl@endangle:\DTLradius) -- cycle;
\fi
Convert decimal to an integer
\dtl@truncatedecimal\dtl@midangle
Determine whether to rotate inner labels
\ifDTLrotateinner

```

If the mid way angle is between 90 and 270, the text will look upside-down, so adjust accordingly.

```
\ifthenelse{(\dtl@midangle > 90 \and \dtl@midangle < 270\)}
\TE@or \dtl@midangle < -90}{%
  \FPsub{\dtl@labelangle}{\dtl@midangle}{180}%
  \dtl@truncatedecimal\dtl@labelangle
  \edef\dtl@innernodeopt{anchor=east,rotate=\dtl@labelangle}%
}{%
  \edef\dtl@innernodeopt{anchor=west,rotate=\dtl@midangle}%
}%
```

Don't rotate inner labels

```
\else
  \edef\dtl@innernodeopt{anchor=center}%
\fi
```

Determine whether to rotate outer labels

```
\ifDTLrotateouter
```

If the mid way angle is between 90 and 270, the text will look upside-down, so adjust accordingly.

```
\ifthenelse{(\dtl@midangle > 90 \and \dtl@midangle < 270\)}
\TE@or \dtl@midangle < -90}{%
  \FPsub{\dtl@labelangle}{\dtl@midangle}{180}%
  \dtl@truncatedecimal\dtl@labelangle
  \edef\dtl@outernodeopt{anchor=east,rotate=\dtl@labelangle}%
}{%
  \edef\dtl@outernodeopt{anchor=west,rotate=\dtl@midangle}%
}%
```

Don't rotate outer labels

```
\else
  \ifthenelse{(\dtl@midangle<45\and\dtl@midangle>-45\)}
  \TE@or \dtl@midangle=45
  \TE@or \dtl@midangle>315}{%
    % east quadrant
    \edef\dtl@outernodeopt{anchor=west}%
  }{%
    \ifthenelse{(\dtl@midangle<135\and\dtl@midangle>45\)}
    \TE@or \dtl@midangle=135}{%
      % north quadrant
      \edef\dtl@outernodeopt{anchor=south}%
    }{%
      \ifthenelse{(\dtl@midangle<225\and\dtl@midangle>135\)}
      \TE@or \dtl@midangle=225
      \TE@or \dtl@midangle=-135
      \TE@or \dtl@midangle<-135}{%
        % west quadrant
        \edef\dtl@outernodeopt{anchor=east}%
      }{%
        \edef\dtl@outernodeopt{anchor=north}%
      }
    }
  }
```

```

    }%
  }
}
\fi

```

Draw inner and outer labels

```

\edef\@dtl@dolabel{%
\noexpand\draw (\dtl@midangle:\the\dtl@inneroffset)
node[\dtl@innernodeopt]{%
\noexpand\DTLdisplayinnerlabel{\noexpand\dtl@innerlabel}};}%
\@dtl@dolabel
\edef\@dtl@dolabel{%
\noexpand\draw (\dtl@midangle:\the\dtl@outeroffset)
node[\dtl@outernodeopt]{%
\noexpand\DTLdisplayouterlabel{\noexpand\dtl@outerlabel}};}%
\@dtl@dolabel
\end{scope}
}%
\DTLpieatendtikz
\end{tikzpicture}
\fi
}}

```

\dtl@computeangles

```
\dtl@computeangles{<n>}{<variable>}
```

Compute the angles for segment $\langle n \rangle$. This sets \dtl@sang@ $\langle n \rangle$ (start angle), \dtl@angle@ $\langle n \rangle$ (extent angle), \dtl@cut@angle@ $\langle n \rangle$ (cut away angle) and \dtl@cut@len@ $\langle n \rangle$ (cut away length).

```

\newcommand*{\dtl@computeangles}[2]{%
\FPifgt{\@dtl@start}{180}%
% if startangle > 180
\let\dtl@old=\@dtl@start
% startangle = startangle - 360
\FPsub{\@dtl@start}{\dtl@old}{360}%
\fi
\FPiflt{\@dtl@start}{-180}%
% if startangle < -180
\let\dtl@old=\@dtl@start
% startangle = startangle + 360
\FPadd{\@dtl@start}{\dtl@old}{360}%
\fi
\expandafter\edef\csname dtl@sang@romannumeral#1\endcsname{%
\@dtl@start}%
\FPmul{\dtl@angle}{360}{#2}%
\let\dtl@old=\dtl@angle
\FPdiv{\dtl@angle}{\dtl@old}{\dtl@total}%
\expandafter\let\csname dtl@angle@romannumeral#1\endcsname=\dtl@angle
\let\dtl@old=\@dtl@start

```

```

\FPadd{\@dtl@start}{\dtl@old}{\dtl@angle}%
\expandafter\def\csname dtl@cut@angle@\romannumeral#1\endcsname{0}%
\expandafter\def\csname dtl@cut@len@\romannumeral#1\endcsname{0cm}%
}

```

Set the offset angles.

`\@dtl@set@off`

```

\def\@dtl@set@off#1-#2\relax{%
\ifthenelse{\equal{#2}{}}{%
\@dtl@set@off{#1}}{%
\@dtl@set@offr#1-#2\relax}%
}

```

Set offset for individual segment:

`\@dtl@set@off`

```

\newcommand*{\@dtl@set@off}[1]{%
\edef\dtl@old{\csname dtl@angle@\romannumeral#1\endcsname}%
\FPmul{\dtl@angle}{\dtl@old}{0.5}%
\let\dtl@old=\dtl@angle
\edef\dtl@sang{\csname dtl@sang@\romannumeral#1\endcsname}%
\FPadd{\dtl@angle}{\dtl@old}{\dtl@sang}%
\expandafter\edef\csname dtl@cut@angle@\romannumeral#1\endcsname{%
\dtl@angle}%
\expandafter\edef\csname dtl@cut@len@\romannumeral#1\endcsname{%
\the\dtl@cutawayoffset}%
}

```

Define count register to keep track of segments

`\@dtl@seg`

```

\newcount\@dtl@seg

```

`\@dtl@set@offr` Set offset for a range of segments

```

\def\@dtl@set@offr#1-#2\relax{%
\ifnum#1>#2\relax
\PackageError{datapie}{Segment ranges must go in ascending order}{%
Try #2-#1 instead of #1-#2}%
\else
\def\dtl@angle{0}%
\@dtl@seg=#1\relax
\whiledo{\not\(\@dtl@seg > #2\)}{%
\let\dtl@old=\dtl@angle
\edef\dtl@segang{\csname dtl@angle@\romannumeral\@dtl@seg\endcsname}%
\FPadd{\dtl@angle}{\dtl@old}{\dtl@segang}%
\advance\@dtl@seg by 1\relax
}%
\let\dtl@old=\dtl@angle
\FPmul{\dtl@angle}{\dtl@old}{0.5}%
}

```

```

\edef\dtl@sang{\csname dtl@sang@\romannumeral#1\endcsname}%
\let\dtl@old=\dtl@angle
\FPadd{\dtl@angle}{\dtl@old}{\dtl@sang}%
\@dtl@seg=#1\relax
\whiledo{\not\(\@dtl@seg > #2\)}{%
\expandafter
\let\csname dtl@cut@angle@\romannumeral\@dtl@seg\endcsname
=\dtl@angle
\expandafter
\edef\csname dtl@cut@len@\romannumeral\@dtl@seg\endcsname{%
\the\dtl@cutawayoffset}
\advance\@dtl@seg by 1\relax
}%
\fi
}

```

8 dataplot.sty

Declare package:

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{dataplot}[2012/07/18 v2.10 (NLCT)]
```

Required packages

```
\RequirePackage{xkeyval}
\RequirePackage{tikz}
\RequirePackage{datatool}
```

Load TikZ plot libraries

```
\usetikzlibrary{plotmarks}
\usetikzlibrary{plohandlers}
```

```
\DTLplotstream \DTLplotstream[<condition>]{<db name>}{<x key>}{<y key>}
```

Add points to a stream from the database called *<db name>* where the *x* coordinates are given by the key *<x key>* and the *y* co-ordinates are given by the key *<y key>*. The optional argument *<condition>* is the same as that for `\DTLforeach`

```
\newcommand*{\DTLplotstream}[4][\boolean{true}]{%
\@sDTLforeach[#1]{#2}{\dtl@x=#3,\dtl@y=#4}{%
\DTLconverttodecimal{\dtl@x}{\dtl@decx}%
\DTLconverttodecimal{\dtl@y}{\dtl@decy}%
\pgfplotstreampoint{\pgfpointxy{\dtl@decx}{\dtl@decy}}}}
```

```
\DTLplotmarks \DTLplotmarks contains a list of plot marks used by \DTLplot.
```

```
\newcommand*{\DTLplotmarks}{%
\pgfuseplotmark{o},%
\pgfuseplotmark{x},%
\pgfuseplotmark{+},%
\pgfuseplotmark{square},%
\pgfuseplotmark{triangle},%
\pgfuseplotmark{diamond},%
\pgfuseplotmark{pentagon},%
\pgfuseplotmark{asterisk},%
\pgfuseplotmark{star}%
}
```

```
\DTLplotmarkcolors \DTLplotmarkcolors contains a list of the plot mark colours.
```

```
\newcommand*{\DTLplotmarkcolors}{%
```

```

        red,%
        green,%
        blue,%
        yellow,%
        magenta,%
        cyan,%
        orange,%
        black,%
        gray}

\DTLplotlines \DTLplotlines contains a list of dash patterns used by \DTLplot.
\newcommand*\DTLplotlines{%
    \pgfsetdash{}{0pt},% solid line
    \pgfsetdash{{10pt}{5pt}}{0pt},%
    \pgfsetdash{{5pt}{5pt}}{0pt},%
    \pgfsetdash{{1pt}{5pt}}{0pt},%
    \pgfsetdash{{5pt}{5pt}{1pt}{5pt}}{0pt},%
    \pgfsetdash{{1pt}{3pt}}{0pt},%
}

\DTLplotlinecolors \DTLplotlinecolors contains a list of the plot line colours.
\newcommand*\DTLplotlinecolors{%
    red,%
    green,%
    blue,%
    yellow,%
    magenta,%
    cyan,%
    orange,%
    black,%
    gray}

\DTLplotwidth The default total plot width is stored in the length \dtlplotwidth
\newlength\DTLplotwidth
\setlength\DTLplotwidth{4in}

\DTLplotheight The default total plot height is stored in the length \dtlplotheight
\newlength\DTLplotheight
\setlength\DTLplotheight{4in}

\DTLticklength The length of the tick marks is given by \DTLticklength
\newlength\DTLticklength
\setlength\DTLticklength{5pt}

\DTLminorticklength The length of the minor tick marks is given by \DTLminorticklength.
\newlength\DTLminorticklength
\setlength\DTLminorticklength{2pt}

```

<code>\DTLticklabeloffset</code>	<p>The offset from the axis to the tick label is given by <code>\DTLticklabeloffset</code>.</p> <pre> \newlength\DTLticklabeloffset \setlength\DTLticklabeloffset{8pt} </pre>
<code>\dtl@xticlabelheight</code>	<p><code>\dtl@xticlabelheight</code> is used to store the height of the x tick labels.</p> <pre> \newlength\dtl@xticlabelheight </pre>
<code>\dtl@yticlabelwidth</code>	<p><code>\dtl@yticlabelwidth</code> is used to store the width of the y tick labels.</p> <pre> \newlength\dtl@yticlabelwidth </pre>
<code>\DTLmintickgap</code>	<p><code>\DTLmintickgap</code> stores the suggested minimum distance between tick marks where the gap is not specified.</p> <pre> \newlength\DTLmintickgap \setlength\DTLmintickgap{20pt} </pre>
<code>\DTLminminortickgap</code>	<p>The suggested minimum distance between minor tick marks where the gap is not specified is given by <code>\DTLminminortickgap</code>.</p> <pre> \newlength\DTLminminortickgap \setlength\DTLminminortickgap{5pt} </pre>
<code>DTLplotroundvar</code>	<p>Round x tick labels to the number of digits given by the counter <code>DTLplotroundXvar</code>.</p> <pre> \newcounter{DTLplotroundXvar} \setcounter{DTLplotroundXvar}{2} </pre>
<code>DTLplotroundYvar</code>	<p>Round y tick labels to the number of digits given by the counter <code>DTLplotroundYvar</code>.</p> <pre> \newcounter{DTLplotroundYvar} \setcounter{DTLplotroundYvar}{2} </pre>
<code>\ifDTLxaxis</code>	<p>The conditional <code>\ifDTLxaxis</code> is used to determine whether or not to display the x axis.</p> <pre> \newif\ifDTLxaxis \DTLxaxistrue </pre>
<code>\DTLXAxisStyle</code>	<p>The style of the x axis is given by <code>\DTLXAxisStyle</code>. This is just a solid line by default.</p> <pre> \newcommand*{\DTLXAxisStyle}{-} </pre>
<code>\ifDTLyaxis</code>	<p>The conditional <code>\ifDTLyaxis</code> is used to determine whether or not to display the y axis</p> <pre> \newif\ifDTLyaxis \DTLyaxistrue </pre>
<code>\DTLYAxisStyle</code>	<p>The style of the y axis is given by <code>\DTLYAxisStyle</code>. This is just a solid line by default.</p> <pre> \newcommand*{\DTLYAxisStyle}{-} </pre>

<code>\DTLmajorgridstyle</code>	<p>The style of the major grid lines is given by <code>\DTLmajorgridstyle</code>.</p> <pre>\newcommand*{\DTLmajorgridstyle}{color=gray,-}</pre>
<code>\DTLminorgridstyle</code>	<p>The style of the minor grid lines is given by <code>\DTLminorgridstyle</code>.</p> <pre>\newcommand*{\DTLminorgridstyle}{color=gray,loosely dotted}</pre>
<code>\ifDTLxticsin</code>	<p>The conditional <code>\ifDTLxticsin</code> is used to determine whether the x ticks should point in or out.</p> <pre>\newif\ifDTLxticsin \DTLxticsintrue</pre>
<code>\ifDTLyticsin</code>	<p>The conditional <code>\ifDTLyticsin</code> is used to determine whether the y ticks should point in or out.</p> <pre>\newif\ifDTLyticsin \DTLyticsintrue</pre>
<code>\dtl@legendsetting</code>	<p>The legend setting is stored in the count register <code>\dtl@legendsetting</code>.</p> <pre>\newcount\dtl@legendsetting</pre>
<code>\DTLlegendxoffset</code>	<p>The gap between the border of plot and legend is given by the lengths <code>\DTLlegendxoffset</code> and <code>\DTLlegendyoffset</code></p> <pre>\newlength\DTLlegendxoffset \setlength\DTLlegendxoffset{10pt}</pre>
<code>\DTLlegendyoffset</code>	<pre>\newlength\DTLlegendyoffset \setlength\DTLlegendyoffset{10pt}</pre>
<code>\DTLformatlegend</code>	<div style="border: 1px solid black; background-color: #ffffcc; padding: 5px;"> <pre>\DTLformatlegend{\langle legend \rangle}</pre> </div> <p>This formats the legend.</p> <pre>\newcommand*{\DTLformatlegend}[1]{% \setlength{\fboxrule}{1.1pt}% \fcolorbox{black}{white}{#1}}</pre>
<code>\ifDTLshowmarkers</code>	<p>The conditional <code>\ifDTLshowmarkers</code> is used to specify whether or not to use markers.</p> <pre>\newif\ifDTLshowmarkers \DTLshowmarkerstrue</pre>
<code>\ifDTLshowlines</code>	<p>The conditional <code>\ifDTLshowlines</code> is used to specify whether or not to use lines.</p> <pre>\newif\ifDTLshowlines \DTLshowlinesfalse</pre>

`\DTLplotatbegintikz` `\DTLplotatbegintikz` is a hook to insert stuff at the start of the `tikzpicture` environment (after the unit vectors have been set).

```
\newcommand*\DTLplotatbegintikz{}
```

`\DTLplotatendtikz` `\DTLplotatendtikz` is a hook to insert stuff at the end of the `tikzpicture` environment.

```
\newcommand*\DTLplotatendtikz{}
```

Plot settings. The database key for the x value is given by the `x` setting:

```
\define@key{dataplot}{x}{%
```

```
\def\dtl@xkey{#1}}
```

The database key for the y value is given by the `y` setting:

```
\define@key{dataplot}{y}{%
```

```
\def\dtl@ykey{#1}}
```

The list of plot mark colours is given by the `markcolors` setting. (This should be a comma separated list of colour names.)

```
\define@key{dataplot}{markcolors}{%
```

```
\def\DTLplotmarkcolors{#1}}
```

The list of plot line colours is given by the `linecolors` setting. (This should be a comma separated list of colour names.)

```
\define@key{dataplot}{linecolors}{%
```

```
\def\DTLplotlinecolors{#1}}
```

The list of plot mark and line colours is given by the `colors` setting. (This should be a comma separated list of colour names.)

```
\define@key{dataplot}{colors}{%
```

```
\def\DTLplotmarkcolors{#1}%
```

```
\def\DTLplotlinecolors{#1}}
```

The list of plot marks is given by the `marks` setting. (This should be a comma separated list of code that generates pgf plot marks.)

```
\define@key{dataplot}{marks}{%
```

```
\def\DTLplotmarks{#1}}
```

The list of plot line styles is given by the `lines` setting. (This should be a comma separated list of code that sets the line style.) An empty set will create solid lines.

```
\define@key{dataplot}{lines}{%
```

```
\def\DTLplotlines{#1}}
```

The total width of the plot is given by the `width` setting.

```
\define@key{dataplot}{width}{%
```

```
\setlength\DTLplotwidth{#1}}
```

The total height of the plot is given by the `height` setting.

```
\define@key{dataplot}{height}{%
```

```
\setlength\DTLplotheight{#1}}
```

Determine whether to show lines, markers or both

```
\define@choicekey{dataplot}{style}[\val\nr]{both,lines,markers}{%
\ifcase\nr\relax
\DTLshowlinestrue
\DTLshowmarkerstrue
\or
\DTLshowlinestrue
\DTLshowmarkersfalse
\or
\DTLshowmarkerstrue
\DTLshowlinesfalse
\fi}
```

Determine whether or not to display the axes

```
\define@choicekey{dataplot}{axes}[\val\nr]{both,x,y,none}[both]{%
\ifcase\nr\relax
% both
\DTLxaxistrue
\DTLxticstrue
\DTLyaxistrue
\DTLyticstrue
\or % x
\DTLxaxistrue
\DTLxticstrue
\DTLyaxisfalse
\DTLyticsfalse
\or % y
\DTLxaxisfalse
\DTLxticsfalse
\DTLyaxistrue
\DTLyticstrue
\or % none
\DTLxaxisfalse
\DTLxticsfalse
\DTLyaxisfalse
\DTLyticsfalse
\fi
}
```

\ifDTLbox Enclose plot in a box

```
\define@boolkey{dataplot}[DTL]{box}[true]{%
\DTLboxfalse}
```

\ifDTLxticstrue Condition to determine whether to show the x tick marks

```
\define@boolkey{dataplot}[DTL]{xtics}[true]{%
\DTLxticstrue}
```

\ifDTLyticstrue Condition to determine whether to show the y tick marks

```
\define@boolkey{dataplot}[DTL]{ytics}[true]{%
\DTLyticstrue}
```

`\ifDTLxminortics` Condition to determine whether to show the x minor tick marks

```

\define@boolkey{dataplot}[DTL]{xminortics}[true]{%
\ifDTLxminortics \DTLxticstrue\fi}
\DTLxminorticsfalse

```

`\ifDTLyminortics` Condition to determine whether to show the y minor tick marks

```

\define@boolkey{dataplot}[DTL]{yminortics}[true]{%
\ifDTLyminortics \DTLyticstrue\fi}
\DTLyminorticsfalse

```

`\ifDTLgrid` Determine whether to draw the grid

```

\define@boolkey{dataplot}[DTL]{grid}[true]{}

```

Determine whether the x tick marks should point in or out:

```

\define@choicekey{dataplot}{xticdir}[\val\nr]{in,out}{%
\ifcase\nr\relax
\DTLxticsintrue
\or
\DTLxticsinfalse
\fi
}

```

Determine whether the y tick marks should point in or out:

```

\define@choicekey{dataplot}{yticdir}[\val\nr]{in,out}{%
\ifcase\nr\relax
\DTLyticsintrue
\or
\DTLyticsinfalse
\fi
}

```

Determine whether the x and y tick marks should point in or out;

```

\define@choicekey{dataplot}{ticdir}[\val\nr]{in,out}{%
\ifcase\nr\relax
\DTLxticsintrue
\DTLyticsintrue
\or
\DTLxticsinfalse
\DTLyticsinfalse
\fi
}

```

Set the bounds of the graph (value must be in the form $\langle \min x \rangle, \langle \min y \rangle, \langle \max x \rangle, \langle \max y \rangle$ (bounds overrides minx, miny, maxx and maxy settings.)

```

\define@key{dataplot}{bounds}{%
\def\dtl@bounds{#1}}
\let\dtl@bounds=\relax

```

Set only the lower x bound

```

\define@key{dataplot}{minx}{%

```

```
\def\dtl@minx{#1}}
\let\dtl@minx=\relax
```

Set only the upper x bound:

```
\define@key{dataplot}{maxx}{%
\def\dtl@maxx{#1}}
\let\dtl@maxx=\relax
```

Set only the lower y bound:

```
\define@key{dataplot}{miny}{%
\def\dtl@miny{#1}}
\let\dtl@miny=\relax
```

Set only the upper y bound:

```
\define@key{dataplot}{maxy}{%
\def\dtl@maxy{#1}}
\let\dtl@maxy=\relax
```

Define list of points for x ticks. (Must be a comma separated list of decimal numbers.)

```
\define@key{dataplot}{xticpoints}{%
\def\dtl@xticlist{#1}\DTLxticstrue\DTLxaxistrue}
\let\dtl@xticlist=\relax
```

Define list of points for y ticks. (Must be a comma separated list of decimal numbers.)

```
\define@key{dataplot}{yticpoints}{%
\def\dtl@yticlist{#1}\DTLyticstrue\DTLyaxistrue}
\let\dtl@yticlist=\relax
```

Define a the gap between x tick marks (xticpoints overrides xticgap)

```
\define@key{dataplot}{xticgap}{\def\dtl@xticgap{#1}%
\DTLxticstrue\DTLxaxistrue}
\let\dtl@xticgap=\relax
```

Define a the gap between y tick marks (yticpoints overrides yticgap)

```
\define@key{dataplot}{yticgap}{\def\dtl@yticgap{#1}%
\DTLyticstrue\DTLyaxistrue}
\let\dtl@yticgap=\relax
```

Define comma separated list of labels for x ticks.

```
\define@key{dataplot}{xticlabels}{%
\def\dtl@xticlabels{#1}\DTLxticstrue\DTLxaxistrue}
\let\dtl@xticlabels=\relax
```

Define comma separated list of labels for y ticks.

```
\define@key{dataplot}{yticlabels}{%
\def\dtl@yticlabels{#1}\DTLyticstrue\DTLyaxistrue}
\let\dtl@yticlabels=\relax
```

Define x axis label

```
\define@key{dataplot}{xlabel}{%
\def\dtl@xlabel{#1}}
\let\dtl@xlabel=\relax
```

Define y axis label

```
\define@key{dataplot}{ylabel}{%
\def\dtl@ylabel{#1}}
\let\dtl@ylabel=\relax
```

The legend setting may be one of: none (don't show it), north, northeast, east, southeast, south, southwest, west, or northwest. These set the count register `\dtl@legendsetting`.

```
\define@choicekey{dataplot}{legend}[\val\nr]{none,north,northeast,%
east,southeast,south,southwest,west,northwest}[northeast]{%
\dtl@legendsetting=\nr\relax
}
```

Legend labels (comma separated list). If omitted, the database name is used.

```
\define@key{dataplot}{legendlabels}{\def\dtl@legendlabels{#1}}
```

`\DTLplot` `\DTLplot[<condition>]{<db list>}{<settings>}`

Creates a plot (inside a tikzpicture environment) of all the data given in the databases listed in *<db list>*.

```
\newcommand*\DTLplot[3][\boolean{true}]{%
\let\dtl@xkey=\relax
\let\dtl@ykey=\relax
\let\dtl@legendlabels=\relax
\setkeys{dataplot}{#3}%
\let\dtl@plotmarklist=\DTLplotmarks
\let\dtl@plotlinelist=\DTLplotlines
\let\dtl@plotmarkcolorlist=\DTLplotmarkcolors
\let\dtl@plotlinecolorlist=\DTLplotlinecolors
\def\dtl@legend{}%
\ifx\dtl@legendlabels\relax
\edef\dtl@legendlabels{#2}%
\fi
\ifx\dtl@xkey\relax
\PackageError{dataplot}{Missing x setting for
\string\DTLplot}{}%
\else
\ifx\dtl@ykey\relax
\PackageError{dataplot}{Missing y setting for
\string\DTLplot}{}%
\else
```

If user didn't specified bounds, compute the maximum and minimum x and y values over all the databases listed.

```
\ifx\dtl@bounds\relax
\DTLcomputebounds[#1]{#2}{\dtl@xkey}{\dtl@ykey}
{\DTLminX}{\DTLminY}{\DTLmaxX}{\DTLmaxY}%
\ifx\dtl@minx\relax
```

```

\else
  \let\DTLminX=\dtl@minx
\fi
\ifx\dtl@maxx\relax
\else
  \let\DTLmaxX=\dtl@maxx
\fi
\ifx\dtl@miny\relax
\else
  \let\DTLminY=\dtl@miny
\fi
\ifx\dtl@maxy\relax
\else
  \let\DTLmaxY=\dtl@maxy
\fi

```

Otherwise extract information from \dtl@bounds

```

\else
  \expandafter\dtl@getbounds\dtl@bounds\@nil
\fi

```

Determine scaling factors.

```

\@dtl@tmpcount=\DTLplotwidth
\FPsub{\dtl@dx}{\DTLmaxX}{\DTLminX}%
\FPdiv{\dtl@unit@x}{\number\@dtl@tmpcount}{\dtl@dx}%
\@dtl@tmpcount=\DTLplotheight
\FPsub{\dtl@dy}{\DTLmaxY}{\DTLminY}%
\FPdiv{\dtl@unit@y}{\number\@dtl@tmpcount}{\dtl@dy}%

```

If x ticks specified, construct a list of x tic points if not already specified.

```

\ifDTLxtics
  \ifx\dtl@xticlist\relax
    \ifx\dtl@xticgap\relax
      \dtl@constructticklist\DTLminX\DTLmaxX
      \dtl@unit@x\dtl@xticlist
    \else
      \DTLifFPopenbetween{0}{\DTLminX}{\DTLmaxX}{%
        \dtl@constructticklistwithgapz
        \DTLminX\DTLmaxX\dtl@xticlist\dtl@xticgap}{%
        \dtl@constructticklistwithgap
        \DTLminX\DTLmaxX\dtl@xticlist\dtl@xticgap}%
    \fi
  \fi

```

Construct a list of x minor tick points if required

```

\let\dtl@xminorticlist\@empty
\ifDTLxminortics
  \let\dtl@prevtick=\relax
  \@for\dtl@nexttick:=\dtl@xticlist\do{%
    \ifx\dtl@prevtick\relax
      \else

```

```

\dtl@constructminorticklist
\dtl@prevtick\dtl@nexttick\dtl@unit@x\dtl@xminorticlist
\fi
\let\dtl@prevtick=\dtl@nexttick
}%
\fi

```

Determine the height of the x tick labels.

```

\ifx\dtl@xticlabels\relax
\settoheight{\dtl@xticlabelheight}{\dtl@xticlist}%
\else
\settoheight{\dtl@xticlabelheight}{\dtl@xticlabels}%
\fi
\else
\setlength{\dtl@xticlabelheight}{0pt}%
\fi

```

If y ticks specified, construct a list of y tic points if not already specified.

```

\setlength{\dtl@yticlabelwidth}{0pt}%
\ifDTLytics
\ifx\dtl@yticlist\relax
\ifx\dtl@yticgap\relax
\dtl@constructticklist\DTLminY\DTLmaxY
\dtl@unit@y\dtl@yticlist
\else
\DTLifFPopenbetween{0}{\DTLminY}{\DTLmaxY}{%
\dtl@constructticklistwithgapz
\DTLminY\DTLmaxY\dtl@yticlist\dtl@yticgap}{%
\dtl@constructticklistwithgap
\DTLminY\DTLmaxY\dtl@yticlist\dtl@yticgap}%
\fi
\fi

```

Construct a list of y minor tick points if required

```

\let\dtl@yminorticlist\@empty
\ifDTLyminortics
\let\dtl@prevtick=\relax
\@for\dtl@nexttick:=\dtl@yticlist\do{%
\ifx\dtl@prevtick\relax
\else
\dtl@constructminorticklist
\dtl@prevtick\dtl@nexttick\dtl@unit@y\dtl@yminorticlist
\fi
\let\dtl@prevtick=\dtl@nexttick
}%
\fi

```

Determine the width of the y tick labels.

```

\ifx\dtl@ylabel\relax
\else
\ifx\dtl@yticlabels\relax

```



```

\@for\dtl@thislabel:=\dtl@yticlist\do{%
  \FPround{\dtl@thislabel}{\dtl@thislabel}
    {\c@DTLplotroundYvar}%
  \settowidth{\dtl@tmplength}{\dtl@thislabel}%
  \ifdim\dtl@tmplength>\dtl@yticlabelwidth
    \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
  \fi
}%
\else
\@for\dtl@thislabel:=\dtl@yticlabels\do{%
  \settowidth{\dtl@tmplength}{\dtl@thislabel}%
  \ifdim\dtl@tmplength>\dtl@yticlabelwidth
    \setlength{\dtl@yticlabelwidth}{\dtl@tmplength}%
  \fi
}%
\fi
\fi

```

Start the picture.

```
\begin{tikzpicture}
```

Set the x and y unit vectors.

```

\pgfsetxvec{\pgfpoint{\dtl@unit@x sp}{0pt}}%
\pgfsetyvec{\pgfpoint{0pt}{\dtl@unit@y sp}}%

```

Add any extra information the user requires

```
\DTLplotatbegintikz
```

Determine whether to put a box around the plot

```

\ifDTLbox
  \draw (\DTLminX,\DTLminY) -- (\DTLmaxX,\DTLminY) --
    (\DTLmaxX,\DTLmaxY) -- (\DTLminX,\DTLmaxY) --
    cycle;
\else

```

Plot x axis if required.

```

\ifDTLxaxis
  \expandafter\draw\expandafter[\DTLXAxisStyle]
    (\DTLminX,\DTLminY) -- (\DTLmaxX,\DTLminY);
\fi

```

Plot y axis if required.

```

\ifDTLyaxis
  \expandafter\draw\expandafter[\DTLYAxisStyle]
    (\DTLminX,\DTLminY) -- (\DTLminX,\DTLmaxY);
\fi
\fi

```

Plot grid if required

```

\ifDTLgrid
  \ifDTLxminortics
    \@for\dtl@thistick:=\dtl@xminorticlist\do{%

```

```

\expandafter\draw\expandafter[\DTLminorgridstyle]
(\dtl@thistick,\DTLminY) -- (\dtl@thistick,\DTLmaxY);
}%
\fi
\ifDTLyminortics
\@for\dtl@thistick:=\dtl@yminorticlist\do{%
\expandafter\draw\expandafter[\DTLminorgridstyle]
(\DTLminX,\dtl@thistick) -- (\DTLmaxX,\dtl@thistick);
}%
\fi
\@for\dtl@thistick:=\dtl@xticlist\do{%
\expandafter\draw\expandafter[\DTLmajorgridstyle]
(\dtl@thistick,\DTLminY) -- (\dtl@thistick,\DTLmaxY);
}%
\@for\dtl@thistick:=\dtl@yticlist\do{%
\expandafter\draw\expandafter[\DTLmajorgridstyle]
(\DTLminX,\dtl@thistick) -- (\DTLmaxX,\dtl@thistick);
}%
\fi

```

Plot x tics if required.

```

\ifDTLxtics
\addtolength\dtl@xticlabelheight{\DTLticklabeloffset}%
\@for\dtl@thistick:=\dtl@xticlist\do{%
\pgfpathmoveto{\pgfpointxy{\dtl@thistick}{\DTLminY}}
\ifDTLxticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLminY}}
{\pgfpoint{0pt}{\DTLticklength}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLminY}}
{\pgfpoint{0pt}{-\DTLticklength}}}
\fi
\ifDTLbox
\pgfpathmoveto{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
\ifDTLxticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
{\pgfpoint{0pt}{-\DTLticklength}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
{\pgfpoint{0pt}{\DTLticklength}}}
\fi
\fi
\pgfusepath{stroke}%

```

Plot the tick labels

```

\ifx\dtl@xticlabels\relax

```

```

\FPround{\dtl@thislabel}{\dtl@thistick}
\c@DTLplotroundXvar}%
\else
\dtl@chopfirst\dtl@xticlabels\dtl@thislabel\dtl@rest
\let\dtl@xticlabels=\dtl@rest
\fi
\pgftext[base,center,at={\pgfpointadd
\pgfpointxy{\dtl@thistick}{\DTLminY}}
\pgfpoint{0pt}{-\dtl@xticlabelheight}}]{%
\dtl@thislabel}
}%
\fi

```

Plot x label if required.

```

\ifx\dtl@xlabel\relax
\else
\addtolength{\dtl@xticlabelheight}{\baselineskip}%
\setlength{\dtl@tmplength}{0.5\DTLplotwidth}
\pgftext[base,center,at={\pgfpointadd
\pgfpointxy{\DTLminX}{\DTLminY}}%
\pgfpoint{\dtl@tmplength}{-\dtl@xticlabelheight}}]{%
\dtl@xlabel}
\fi

```

Plot the x minor ticks if required

```

\ifDTLxminortics
\@for\dtl@thistick:=\dtl@xminorticlist\do{%
\pgfpathmoveto{\pgfpointxy{\dtl@thistick}{\DTLminY}}
\ifDTLxticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLminY}}
\pgfpoint{0pt}{\DTLminorticklength}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLminY}}
\pgfpoint{0pt}{-\DTLminorticklength}}}
\fi
\ifDTLbox
\pgfpathmoveto{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
\ifDTLxticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
\pgfpoint{0pt}{-\DTLminorticklength}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\dtl@thistick}{\DTLmaxY}}
\pgfpoint{0pt}{\DTLminorticklength}}}
\fi
\fi
}%

```

```

\fi
Plot y ticks if required.
\ifDTLytics
\@for\dtl@thistick:=\dtl@yticlist\do{%
\pgfpathmoveto{\pgfpointxy{\DTLminX}{\dtl@thistick}}
\ifDTLyticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLminX}{\dtl@thistick}}
{\pgfpoint{\DTLticklength}{0pt}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLminX}{\dtl@thistick}}
{\pgfpoint{-\DTLticklength}{0pt}}}
\fi
\ifDTLbox
\pgfpathmoveto{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
\ifDTLyticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
{\pgfpoint{-\DTLticklength}{0pt}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
{\pgfpoint{\DTLticklength}{0pt}}}
\fi
\fi
\pgfusepath{stroke}
Plot the y tick labels if required
\ifx\dtl@yticlabels\relax
\FPround{\dtl@thislabel}{\dtl@thistick}
{\c@DTLplotroundYvar}%
\else
\dtl@chopfirst\dtl@yticlabels\dtl@thislabel\dtl@rest
\let\dtl@yticlabels=\dtl@rest
\fi
\pgftext[right,at={\pgfpointadd
{\pgfpointxy{\DTLminX}{\dtl@thistick}}
{\pgfpoint{-\DTLticklabeloffset}{0pt}}}]
{\dtl@thislabel}
}%
\fi
Plot y label if required.
\ifx\dtl@ylabel\relax
\else
\addtolength{\dtl@yticlabelwidth}{\baselineskip}%
\setlength{\dtl@tmplength}{0.5\DTLplotheight}
\pgftext[bottom,center,at={\pgfpointadd
{\pgfpointxy{\DTLminX}{\DTLminY}}}%

```

```

        {\pgfpoint{-\dtl@yticlabelwidth}{\dtl@tmplength}},
        rotate=90]{%
\dtl@ylabel}
\fi

```

Plot the y minor ticks if required

```

\ifDTLyminortics
\@for\dtl@thistick:=\dtl@yminorticlist\do{%
\pgfpathmoveto{\pgfpointxy{\DTLminX}{\dtl@thistick}}
\ifDTLyticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLminX}{\dtl@thistick}}
{\pgfpoint{\DTLminorticklength}{0pt}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLminX}{\dtl@thistick}}
{\pgfpoint{-\DTLminorticklength}{0pt}}}
\fi
\ifDTLbox
\pgfpathmoveto{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
\ifDTLyticsin
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
{\pgfpoint{-\DTLminorticklength}{0pt}}}
\else
\pgfpathlineto{
\pgfpointadd{\pgfpointxy{\DTLmaxX}{\dtl@thistick}}
{\pgfpoint{\DTLminorticklength}{0pt}}}
\fi
\fi
\pgfusepath{stroke}
}%
\fi

```

Iterate through each database

```
\@for\dtl@thisdb:=#2\do{%
```

Get the current plot mark colour.

```

\ifx\dtl@plotmarkcolorlist\@empty
\let\dtl@plotmarkcolorlist=\DTLplotmarkcolors
\fi
\dtl@chopfirst\dtl@plotmarkcolorlist\dtl@thisplotmarkcolor
\dtl@remainder
\let\dtl@plotmarkcolorlist=\dtl@remainder

```

Get the current plot mark, and store in \dtl@mark

```

\ifDTLshowmarkers
\ifx\dtl@plotmarklist\@empty
\let\dtl@plotmarklist=\DTLplotmarks
\fi
\dtl@chopfirst\dtl@plotmarklist\dtl@thisplotmark

```

```

\dtl@remainder
\let\dtl@plotmarklist=\dtl@remainder
\ifx\dtl@thisplotmark\relax
\let\dtl@mark=\relax
\else
\expandafter\toks@\expandafter{\dtl@thisplotmark}%
\ifx\dtl@thisplotmarkcolor\@empty
\edef\dtl@mark{\the\toks@}%
\else
\edef\dtl@mark{%
\noexpand\color{\dtl@thisplotmarkcolor}%
\the\toks@}%
\fi
\fi
\else
\let\dtl@mark=\relax
\fi

```

Get the current plot line colour.

```

\ifx\dtl@plotlinecolorlist\@empty
\let\dtl@plotlinecolorlist=\DTLplotlinecolors
\fi
\dtl@chopfirst\dtl@plotlinecolorlist\dtl@thisplotlinecolor
\dtl@remainder
\let\dtl@plotlinecolorlist=\dtl@remainder

```

Get the current line style, and store in \dtl@linestyle

```

\ifDTLshowlines
\ifx\dtl@plotlinelist\@empty
\let\dtl@plotlinelist=\DTLplotlines
\fi
\dtl@chopfirst\dtl@plotlinelist\dtl@thisplotline
\dtl@remainder
\let\dtl@plotlinelist=\dtl@remainder
\expandafter\ifx\dtl@thisplotline\relax
\let\dtl@linestyle=\relax
\else
\expandafter\toks@\expandafter{\dtl@thisplotline}%
\ifx\dtl@thisplotlinecolor\@empty
\edef\dtl@linestyle{\the\toks@}%
\else
\edef\dtl@linestyle{%
\noexpand\color{\dtl@thisplotlinecolor}%
\the\toks@}%
\fi
\fi
\else
\let\dtl@linestyle=\relax
\fi

```

Append this plot setting to the legend.

```

\ifnum\dtl@legendsetting>0\relax
\dtl@chopfirst\dtl@legendlabels\dtl@thislabel\dtl@rest
\let\dtl@legendlabels=\dtl@rest
\expandafter\toks@\expandafter{\dtl@mark}%
\expandafter\@dtl@toks\expandafter{\dtl@linestyle}%
\edef\dtl@addtolegend{\noexpand\DTLaddtoplotlegend
  {\the\toks@}{\the\@dtl@toks}{\dtl@thislabel}}%
\dtl@addtolegend
\fi

Store stream in \dtl@stream
\def\dtl@stream{\pgfplotstreamstart}%

Only plot points that lie inside bounds.
\@sDTLforeach[#1]{\dtl@thisdb}{\dtl@x=\dtl@xkey,%
  \dtl@y=\dtl@ykey}{%
  \DTLconverttodecimal{\dtl@x}{\dtl@decx}%
  \DTLconverttodecimal{\dtl@y}{\dtl@decy}%
  \ifthenelse{%
    \DTLisclosedbetween{\dtl@x}{\DTLminX}{\DTLmaxX}%
    \and
    \DTLisclosedbetween{\dtl@y}{\DTLminY}{\DTLmaxY}%
  }{%
    \expandafter\toks@\expandafter{\dtl@stream}%
    \edef\dtl@stream{\the\toks@
      \noexpand\pgfplotstreampoint
      {\noexpand\pgfpointxy{\dtl@decx}{\dtl@decy}}}%
  }{%
  }%
}%
\expandafter\toks@\expandafter{\dtl@stream}%
\edef\dtl@stream{\the\toks@\noexpand\pgfplotstreamend}%

End plot stream and draw path.
\ifx\dtl@linestyle\relax
\else
\begin{scope}
\dtl@linestyle
\pgfplotthandlerlineto
\dtl@stream
\pgfusepath{stroke}
\end{scope}
\fi
\ifx\dtl@mark\relax
\else
\begin{scope}
\pgfplotthandlermark{\dtl@mark}%
\dtl@stream
\pgfusepath{stroke}
\end{scope}
\fi
}%

```

Plot legend if required.

```

\ifcase\dtl@legendsetting
% none
\or % north
  \pgftext[top,center,at={\pgfpointadd
    {\pgfpointxy{\DTLminX}{\DTLmaxY}}
    {\pgfpoint{0.5\DTLplotwidth}{-\DTLlegendyoffset}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % north east
  \pgftext[top,right,at={\pgfpointadd
    {\pgfpointxy{\DTLmaxX}{\DTLmaxY}}
    {\pgfpoint{-\DTLlegendxoffset}{-\DTLlegendyoffset}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % east
  \pgftext[center,right,at={\pgfpointadd
    {\pgfpointxy{\DTLmaxX}{\DTLminY}}
    {\pgfpoint{-\DTLlegendxoffset}{0.5\DTLplotheight}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % south east
  \pgftext[bottom,right,at={\pgfpointadd
    {\pgfpointxy{\DTLmaxX}{\DTLminY}}
    {\pgfpoint{-\DTLlegendxoffset}{\DTLlegendyoffset}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % south
  \pgftext[center,bottom,at={\pgfpointadd
    {\pgfpointxy{\DTLminX}{\DTLminY}}
    {\pgfpoint{0.5\DTLplotwidth}{\DTLlegendyoffset}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % south west
  \pgftext[bottom,left,at={\pgfpointadd
    {\pgfpointxy{\DTLminX}{\DTLminY}}
    {\pgfpoint{\DTLlegendxoffset}{\DTLlegendyoffset}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % west
  \pgftext[center,left,at={\pgfpointadd
    {\pgfpointxy{\DTLminX}{\DTLminY}}
    {\pgfpoint{\DTLlegendxoffset}{0.5\DTLplotheight}}}]
    {\DTLformatlegend
      {\begin{tabular}{c1}\dtl@legend\end{tabular}}}
\or % north west
  \pgftext[top,left,at={\pgfpointadd
    {\pgfpointxy{\DTLminX}{\DTLmaxY}}
    {\pgfpoint{\DTLlegendxoffset}{-\DTLlegendyoffset}}}]

```



```

        {\DTLformatlegend
        {\begin{tabular}{c1}\dtl@legend\end{tabular}}}}
    \fi
    \DTLplotatendtiks
    \end{tikzpicture}
  \fi
\fi
\fi
}}

```

`\dtl@getbounds` Extract bounds:

```

\def\dtl@getbounds#1,#2,#3,#4\@nil{%
\def\DTLminX{#1}%
\def\DTLminY{#2}%
\def\DTLmaxX{#3}%
\def\DTLmaxY{#4}%
\FPifgt{\DTLminX}{\DTLmaxX}
\PackageError{dataplot}{Min X > Max X in bounds #1,#2,#3,#4}{%
The bounds must be specified as minX,minY,maxX,maxY}%
\fi
\FPifgt{\DTLminY}{\DTLmaxY}
\PackageError{dataplot}{Min Y > Max Y in bounds #1,#2,#3,#4}{%
The bounds must be specified as minX,minY,maxX,maxY}%
\fi
}

```

`\dtl@constructticklist`

`\dtl@constructticklist{<min>}{<max>}{<scale factor>}{<list>}`

Constructs a list of tick points between *<min>* and *<max>* and store in *<list>* (a control sequence.)

```

\newcommand*\dtl@constructticklist[4]{%
\DTLifFPopenbetween{0}{#1}{#2}{%
\FPsub{\@dtl@width}{0}{#1}%
\FPmul{\@dtl@width}{\@dtl@width}{#3}%
\FPdiv{\@dtl@neggap}{\@dtl@width}{10}%
\setlength\dtl@tmplength{\@dtl@neggap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@neggap}{\@dtl@width}{4}%
\setlength\dtl@tmplength{\@dtl@neggap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@neggap}{\@dtl@width}{2}%
\setlength\dtl@tmplength{\@dtl@neggap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\let\@dtl@neggap=\@dtl@width
\fi
\fi
\fi
\FPmul{\@dtl@width}{#2}{#3}%

```

```

\FPdiv{\@dtl@posgap}{\@dtl@width}{10}%
\setlength\dtl@tmplength{\@dtl@posgap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@posgap}{\@dtl@width}{4}%
\setlength\dtl@tmplength{\@dtl@posgap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@posgap}{\@dtl@width}{2}%
\setlength\dtl@tmplength{\@dtl@posgap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\let\@dtl@posgap=\@dtl@width
\fi
\fi
\fi
\FPmax{\@dtl@gap}{\@dtl@neggap}{\@dtl@posgap}%
\FPdiv{\@dtl@gap}{\@dtl@gap}{#3}%
\dtl@constructticklistwithgapz{#1}{#2}{#4}{\@dtl@gap}%
}%
\FPsub{\@dtl@width}{#2}{#1}%
\FPmul{\@dtl@width}{\@dtl@width}{#3}%
\FPdiv{\@dtl@gap}{\@dtl@width}{10}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@gap}{\@dtl@width}{4}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\FPdiv{\@dtl@gap}{\@dtl@width}{2}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLmintickgap
\let\@dtl@gap=\@dtl@width
\fi
\fi
\fi
\FPdiv{\@dtl@gap}{\@dtl@gap}{#3}%
\dtl@constructticklistwithgapz{#1}{#2}{#4}{\@dtl@gap}%
}%
}

```

constructticklistwithgap

```
\dtl@constructticklistwithgap{<min>}{<max>}{<list>}{<gap>}
```

Constructs a list of tick points between *<min>* and *<max>* and store in *<list>* (a control sequence) using the gap given by *<gap>* where the gap is given in user co-ordinates.

```

\newcommand*{\dtl@constructticklistwithgap}[4]{%
\edef\@dtl@thistick{#1}%
\edef#3{#1}%
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
\whiledo{\DTLisFPopenbetween{\@dtl@thistick}{#1}{#2}}{%
\expandafter\toks@\expandafter{\@dtl@thistick}%

```

```

\edef#3{#3,\the\toks@}%
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
}%
\expandafter\toks@\expandafter{#2}%
\edef#3{#3,\the\toks@}%
}

```

constructticklistwithgapz

```
\dtl@constructticklistwithgapz{<min>}{<max>}{<list>}{<gap>}
```

Constructs a list of tick points between $\langle min \rangle$ and $\langle max \rangle$ and store in $\langle list \rangle$ (a control sequence) using the gap given by $\langle gap \rangle$ where the tick list straddles zero.

```

\newcommand*\dtl@constructticklistwithgapz[4]{%
\edef\@dtl@thistick{0}%
\edef#3{0}%
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
\whiledo{DTLisFPopenbetween{\@dtl@thistick}{0}{#2}}{%
\expandafter\toks@\expandafter{\@dtl@thistick}%
\edef#3{#3,\the\toks@}%
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
}%
\expandafter\toks@\expandafter{#2}%
\edef#3{#3,\the\toks@}%
\FPifeq{#1}{0}%
\else
\edef\@dtl@thistick{0}%
\FPsub{\@dtl@thistick}{\@dtl@thistick}{#4}%
\whiledo{DTLisFPopenbetween{\@dtl@thistick}{#1}{0}}{%
\expandafter\toks@\expandafter{\@dtl@thistick}%
\edef#3{\the\toks@,#3}%
\FPsub{\@dtl@thistick}{\@dtl@thistick}{#4}%
}%
\expandafter\toks@\expandafter{#1}%
\edef#3{\the\toks@,#3}%
\fi
}

```

constructminorticklist

```
\dtl@constructminorticklist{<min>}{<max>}{<scale factor>}{<list>}
```

Constructs a list of minor tick points between $\langle min \rangle$ and $\langle max \rangle$ and append to $\langle list \rangle$ (a control sequence.)

```

\newcommand*\dtl@constructminorticklist[4]{%
\FPsub{\@dtl@width}{#2}{#1}%
\FPmul{\@dtl@width}{\@dtl@width}{#3}%
\FPdiv{\@dtl@gap}{\@dtl@width}{10}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLminminortickgap

```

```

\FPdiv{\@dtl@gap}{\@dtl@width}{4}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLminminortickgap
\FPdiv{\@dtl@gap}{\@dtl@width}{2}%
\setlength\dtl@tmplength{\@dtl@gap sp}%
\ifdim\dtl@tmplength<\DTLminminortickgap
\let\@dtl@gap=\@dtl@width
\fi
\fi
\fi
\FPdiv{\@dtl@gap}{\@dtl@gap}{#3}%
\dtl@constructticklistwithgapex{#1}{#2}{\dtl@tmp}{\@dtl@gap}%
\ifx#4\@empty
\let#4=\dtl@tmp
\else
\expandafter\toks@\expandafter{#4}%
\edef#4{#4,\dtl@tmp}%
\fi
}

```

\dtl@constructticklistwithgapex

`\dtl@constructticklistwithgapex{<min>}{<max>}{<list>}{<gap>}`

Constructs a list of tick points between *<min>* and *<max>* and store in *<list>* (a control sequence) using the gap given by *<gap>* where the gap is given in user co-ordinates. The end points are excluded from the list.

```

\newcommand*\dtl@constructticklistwithgapex[4]{%
\edef\@dtl@thistick{#1}%
\let#3=\@empty
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
\whiledo{\DTLisFPopenbetween{\@dtl@thistick}{#1}{#2}}{%
\expandafter\toks@\expandafter{\@dtl@thistick}%
\ifx#3\@empty
\edef#3{\the\toks@}%
\else
\edef#3{#3,\the\toks@}%
\fi
\FPadd{\@dtl@thistick}{\@dtl@thistick}{#4}%
}%
}

```

\DTLaddtoplotlegend

`\DTLaddtoplotlegend{<marker>}{<line style>}{<label>}`

Adds entry to legend.

```

\newcommand*\DTLaddtoplotlegend[3]{%
\def\dtl@legendline{%
\ifx\relax#2\relax

```

```

\else
  \toks@{#2%
  \pgfpathmoveto{\pgfpoint{-10pt}{0pt}}}%
  \pgfpathlineto{\pgfpoint{10pt}{0pt}}}%
  \pgfusepath{stroke}}%
  \edef\dtl@legendline{\the\toks@}%
\fi
\ifx\relax#1\relax
\else
  \toks@{#1}%
  \expandafter\@dtl@toks\expandafter{\dtl@legendline}%
  \edef\dtl@legendline{\the\@dtl@toks\the\toks@}%
\fi
\expandafter\toks@\expandafter{\dtl@legendline}%
\ifx\dtl@legend\@empty
  \edef\dtl@legend{\noexpand\tikz\the\toks@; \noexpand& #3}%
\else
  \expandafter\@dtl@toks\expandafter{\dtl@legend}%
  \edef\dtl@legend{\the\@dtl@toks\noexpand\\%
    \noexpand\tikz\the\toks@; \noexpand& #3}%
\fi
}

```

9 person.sty

9.1 Package Declaration

Package identification:

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{person}[2012/07/18 v2.10 (NLCT)]
```

Requires the ifthen package.

```
\RequirePackage{ifthen}
\RequirePackage{datatool}
```

9.2 Defining People

`people` Keep count of the number of people who have been defined:

```
\newcounter{people}
```

`person` Temporary counter

```
\newcounter{person}
```

`\@people@list` Keep a list of labels for each person who has been defined:

```
\newcommand*{\@people@list}{,}
```

`\@get@firstperson` Get the first person's name in `\@people@list`, and store in the argument (which must be a control sequence.)

```
\newcommand*{\@get@firstperson}[1]{%
  \expandafter\@get@firstperson\@people@list,\@nil{#1}}
\def\@get@firstperson,#1,#2\@nil#3{%
  \def#3{#1}%
}
```

`\malelabels` List of labels that can be used to indicate that a person is male (when defining a person using `\newperson`).

```
\newcommand*{\malelabels}{male, Male, MALE, M, m}
```

`\addmalelabel` Adds a label to the list of male labels.

```
\newcommand*{\addmalelabel}[1]{%
  \expandafter\@dtl@toksA\expandafter{\malelabels}%
  \expandafter\@dtl@toksB\expandafter{#1}%
  \edef\malelabels{\the\@dtl@toksA,\the\@dtl@toksB}%
}
```

`\addfemalelabel` Adds a label to the list of female labels.

```

\newcommand*\addfemalelabel[1]{%
  \expandafter\@dtl@toksA\expandafter{\femalelabels}%
  \expandafter\@dtl@toksB\expandafter{#1}%
  \edef\femalelabels{\the\@dtl@toksA,\the\@dtl@toksB}%
}

```

`\femalelabels` List of labels that can be used to indicate that a person is female (when defining a person using `\newperson`).

```

\newcommand*\femalelabels{female,Female,FEMALE,F,f}

```

`\ifmalelabel` Determines if first argument is contained in the list of male labels. (One level expansion is performed on the first object in first argument.) If true does second argument, otherwise does third argument.

```

\newcommand*\ifmalelabel[3]{%
  \expandafter\DTLifinlist\expandafter{#1}{\malelabels}{#2}{#3}%
}

```

`\iffemalelabel` Determines if first argument is contained in the list of female labels. (One level expansion is performed on the first object in first argument.) If true does second argument, otherwise does third argument.

```

\newcommand*\iffemalelabel[3]{%
  \expandafter\DTLifinlist\expandafter{#1}{\femalelabels}{#2}{#3}%
}

```

`\newperson` Define a new person. The optional argument specifies a label with which to refer to that person. If omitted, `anon` is used. If more than one person is defined, the optional argument will be required to specify a unique label. The compulsory arguments are the person's full name, their familiar name and their gender.

```

\newcommand*\newperson[4][anon]{%
  \@ifundefined{person@#1@name}%
  {%
    \ifmalelabel{#4}%
    {%
      \expandafter\gdef\csname person@#1@gender\endcsname{male}%
    }%
    {%
      \iffemalelabel{#4}%
      {%
        \expandafter\gdef\csname person@#1@gender\endcsname{female}%
      }%
      {%
        \PackageError{person}{Unknown gender ‘#4’ for person
          ‘#1’}{Allowed gender labels are: \malelabels\space or
          \femalelabels}%
        \@namedef{person@#1@gender}{other}%
      }%
    }%
  }%
}

```

```

}%
\expandafter
\protected@xdef\csname person@#1@fullname\endcsname{#2}%
\expandafter
\protected@xdef\csname person@#1@name\endcsname{#3}%
\protected@xdef\@people@list{\@people@list#1,}%
\stepcounter{people}%
}%
{%
\PackageError{person}{Person ‘#1’ has already been defined}{}%
}%
}

```

9.3 Remove People

`\removeperson` Removes person identified by their label from the list.

```

\newcommand*{\removeperson}[1][anon]{%
\edef\@person@label{#1}%
\expandafter\@removeperson\expandafter{\@person@label}%
}

```

The label has to be full expanded for the internal command.

```

\newcommand*{\@removeperson}[1]{%
\ifpersonexists{#1}%
{%

```

Remove label from list of people.

```

\def\@remove@person##1,#1,##2\@nil{%
\def\@prsn@pre{##1}\def\@prsn@post{##2}}%
\expandafter\@remove@person\@people@list\@nil
\xdef\@people@list{\@prsn@pre,\@prsn@post}%

```

Decrement number of people:

```

\addtocounter{people}{-1}%

```

Undefine associated control sequences:

```

\expandafter\global\expandafter
\let\csname person@#1@name\endcsname\undefined
\expandafter\global\expandafter
\let\csname person@#1@fullname\endcsname\undefined
\expandafter\global\expandafter
\let\csname person@#1@gender\endcsname\undefined
}%
{%
\PackageError{person}{Can’t remove person ‘#1’: no such
person}{}%
}%
}

```


`\removepeople` Removes the people listed.

```

\newcommand*\removepeople}[1]{%
  \@for\@thisperson:=#1\do{%
    \ifx\@thisperson\@empty
    \else
      \expandafter\removeperson\expandafter[\@thisperson]%
    \fi
  }%
}

```

`\removeallpeople` Removes everyone.

```

\newcommand*\removeallpeople{%
  \@for\@thisperson:=\@people@list\do{%
    \expandafter\global\expandafter
      \let\csname person@\@thisperson @name\endcsname\undefined
    \expandafter\global\expandafter
      \let\csname person@\@thisperson @fullname\endcsname\undefined
    \expandafter\global\expandafter
      \let\csname person@\@thisperson @gender\endcsname\undefined
  }%
  \setcounter{people}{0}%
  \gdef\@people@list{,}%
}

```

9.4 Conditionals and Loops

`\ifpersonexists` If person whose label is given by the first argument exists, then do the second argument otherwise do third argument.

```

\newcommand{\ifpersonexists}[3]{%
  \@ifundefined{person@#1@name}{#3}{#2}%
}

```

`\ifmale` If the person given by the label in the first argument is male, do the second argument, otherwise do the third argument.

```

\newcommand{\ifmale}[3]{%
  \ifpersonexists{#1}%
  {%
    \edef\@gender{\csname person@\@thisperson @gender\endcsname}%
    \ifx\@gender\@male@label
      #2%
    \else
      #3%
    \fi
  }%
  {%
    \PackageError{person}{Person ‘#1’ doesn’t exist.}{}%
  }%
}

```

```

}
\def\@male@label{male}

```

`\ifallmale` If all people listed in first argument are male, do the second argument otherwise do the third argument. If the first argument is omitted, all defined people are checked.

```

\newcommand{\ifallmale}[3][\@people@list]{%
  \@for\@thisperson:=#1\do{%
    \ifpersonexists{\@thisperson}%
    {%
      \edef\@gender{\csname person@\@thisperson @gender\endcsname}%
      \ifx\@gender\@male@label
      \else
        \@endfortrue
      \fi
    }%
    {%
      \PackageError{person}{Person ‘#1’ doesn’t exist.}{}%
    }%
  }%
  \if@endfor
  #3%
\else
  #2%
\fi
}

```

`\iffemale` If the person given by the label in the first argument is female, do the second argument, otherwise do the third argument.

```

\newcommand{\iffemale}[3]{%
  \ifpersonexists{#1}%
  {%
    \edef\@gender{\csname person@\@thisperson @gender\endcsname}%
    \ifx\@gender\@female@label
      #2%
    \else
      #3%
    \fi
  }%
  {%
    \PackageError{person}{Person ‘#1’ doesn’t exist.}{}%
  }%
}
\def\@female@label{female}

```

`\ifallfemale` If all people listed in first argument are female, do the second argument otherwise do the third argument.

```

\newcommand{\ifallfemale}[3][\@people@list]{%

```

```

\@for\@thisperson:=#1\do{%
  \edef\@gender{\csname person@\@thisperson @gender\endcsname}%
  \ifx\@gender\@female@label
  \else
    \@endfortrue
  \fi
}%
\if@endfor
#3%
\else
#2%
\fi
}

```

\foreachperson

```

\foreachperson(<name cs>,<full name cs>,<gender cs>,<label
cs>)\in{<list>}\do{<body>}

```

Iterates through list of people the \in{<list>} is optional. If omitted, the list of all defined people is used.

```

\def\foreachperson(#1,#2,#3,#4)#5{%
  \ifx#5\in
    \def\@do@foreachperson{\@foreachperson(#1,#2,#3,#4)#5}%
  \else
    \def\@do@foreachperson{%
      \@foreachperson(#1,#2,#3,#4)\in\@people@list#5}%
  \fi
  \@do@foreachperson
}
\long\def\@foreachperson(#1,#2,#3,#4)\in#5\do#6{%
  \@for#4:=#5\do{%
    \ifx#4\@empty
    \else
      \ifpersonexists{#4}%
      {%
        \expandafter
          \let\expandafter#1\csname person@#4@name\endcsname
        \expandafter
          \let\expandafter#2\csname person@#4@fullname\endcsname
        \expandafter
          \let\expandafter#3\csname person@#4@gender\endcsname
        \ifx#3\@male@label
          \let#3\malename
        \else
          \ifx#3\@female@label
            \let#3\femalename
          \fi
        \fi
      }
    \fi
    #6%
  }
}

```

```

    }%
    {%
    \PackageError{person}{Person ‘#4’ doesn’t exist}{}%
    }%
  \fi
}%
}

```

9.5 Predefined Words

These commands should be redefined if you are writing in another language, but note that these are structured according to English grammar.

`\malepronoun`

```
\newcommand*{\malepronoun}{he}
```

`\femalepronoun`

```
\newcommand*{\femalepronoun}{she}
```

`\pluralpronoun`

```
\newcommand*{\pluralpronoun}{they}
```

`\maleobjpronoun`

```
\newcommand*{\maleobjpronoun}{him}
```

`\femaleobjpronoun`

```
\newcommand*{\femaleobjpronoun}{her}
```

`\pluralobjpronoun`

```
\newcommand*{\pluralobjpronoun}{them}
```

`\malepossadj`

```
\newcommand*{\malepossadj}{his}
```

`\femalepossadj`

```
\newcommand*{\femalepossadj}{her}
```

`\pluralpossadj`

```
\newcommand*{\pluralpossadj}{their}
```

`\maleposspronoun`

```
\newcommand*{\maleposspronoun}{his}
```

`\femaleposspronoun`

```
\newcommand*{\femaleposspronoun}{hers}
```

```

\pluralposspronoun
    \newcommand*{\pluralposspronoun}{theirs}

    \malechild
        \newcommand*{\malechild}{son}

    \femalechild
        \newcommand*{\femalechild}{daughter}

    \pluralchild
        \newcommand*{\pluralchild}{children}

    \malechildren
        \newcommand*{\malechildren}{sons}

    \femalechildren
        \newcommand*{\femalechildren}{daughters}

    \maleparent
        \newcommand*{\maleparent}{father}

    \femaleparent
        \newcommand*{\femaleparent}{mother}

    \pluralparent
        \newcommand*{\pluralparent}{parents}

    \malesibling
        \newcommand*{\malesibling}{brother}

    \femalesibling
        \newcommand*{\femalesibling}{sister}

    \pluralsibling
        \newcommand*{\pluralsibling}{siblings}

    \malesiblings
        \newcommand*{\malesiblings}{brothers}

    \femalesiblings
        \newcommand*{\femalesiblings}{sisters}

    \andname Define \andname if it hasn't already been defined:
        \providecommand*{\andname}{and}

    \malename
        \newcommand*{\malename}{male}

```

`\femalename` `\newcommand*{\femalename}{female}`

`\personsep` Separator to use between people (but not the between the last two).
 `\newcommand*{\personsep}{, }`

`\personlastsep` Separator to use between last two people.
 `\newcommand*{\personlastsep}{\space\andname\space}`

`\twopeoplesep` Separator to use when list only contains two people.
 `\newcommand*{\twopeoplesep}{\space\andname\space}`

9.6 Displaying Information

`\personfullname` The person's full name can be displayed using `\personfullname[⟨label⟩]`, where `⟨label⟩` is the unique label used when defining that person. If `⟨label⟩` is omitted, `anon` is used.

```

\newcommand*{\personfullname}[1][anon]{%
  \ifundefined{person@#1@fullname}%
  {%
    \PackageError{person}{Person '#1' has not been defined}{}%
  }%
  {%
    \csname person@#1@fullname\endcsname
  }%
}

```

`\peoplefullname` List all defined people's full names. This iterates through all labels in `\@people@list`.

```

\newcommand*{\peoplefullname}{%
  \setcounter{person}{1}%
  \@for\@thisperson:=\@people@list\do{%
    \ifthenelse{\equal{\@thisperson}{}}{%
    }{%
      \personfullname[\@thisperson]%
      \stepcounter{person}%
      \ifnum\c@people=1\relax
      \else
        \ifnum\c@person=\c@people
          \ifnum\c@people=2\relax
            \twopeoplesep
          \else
            \personlastsep
          \fi
        \else
          \ifnum\c@person<\c@people
            \personsep

```

```

        \fi
      \fi
    \fi
  }%
}%
}

```

`\personname` As `\personfullname`, but for the person's familiar name.

```

\newcommand*{\personname}[1][anon]{%
  \@ifundefined{person@#1@name}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \csname person@#1@name\endcsname
  }%
}

```

`\peoplename` List all defined people's familiar names. This iterates through all labels in `\@people@list`.

```

\newcommand*{\peoplename}{%
  \setcounter{person}{1}%
  \@for\@thisperson:=\@people@list\do{%
    \ifthenelse{\equal{\@thisperson}{}}%
    {}%
    {%
      \personname[\@thisperson]%
      \stepcounter{person}%
      \ifnum\c@people=1\relax
      \else
        \ifnum\c@person=\c@people
          \ifnum\c@people=2\relax
            \twopeoplesep
          \else
            \personlastsep
          \fi
        \else
          \ifnum\c@person<\c@people
            \personsep
          \fi
        \fi
      \fi
    }%
  }%
}

```

`\personpronoun` Display the pronoun (he/she) according to the person's gender.

```

\newcommand*{\personpronoun}[1][anon]{%
  \@ifundefined{person@#1@gender}%

```

```

    {%
      \PackageError{person}{Person ‘#1’ has not been defined}{}%
    }%
    {%
      \edef\@gender{\csname person@#1@gender\endcsname}%
      \csname\@gender pronoun\endcsname
    }%
  }

```

`\Personpronoun` As above, but make the first letter uppercase.

```

\newcommand*{\Personpronoun}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter
    \MakeUppercase\csname\@gender pronoun\endcsname
  }%
}

```

`\peoplepronoun` If there is more than one person, `\peoplepronoun` will use `\pluralpronoun`, otherwise it will use `\personpronoun`.

```

\newcommand*{\peoplepronoun}{%
  \ifnum\c@people>1\relax
    \pluralpronoun
  \else
    \@get@firstperson{\@thisperson}%
    \personpronoun[\@thisperson]%
  \fi
}

```

`\Peoplepronoun` As above, but first letter in upper case

```

\newcommand*{\Peoplepronoun}{%
  \ifnum\c@people>1\relax
    \expandafter\MakeUppercase\pluralpronoun
  \else
    \@get@firstperson{\@thisperson}%
    \Personpronoun[\@thisperson]%
  \fi
}

```

`\personobjpronoun` Display the objective pronoun (him/her) according to the person’s gender.

```

\newcommand*{\personobjpronoun}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
}

```



```

    {%
      \edef\@gender{\csname person@#1@gender\endcsname}%
      \csname\@gender objpronoun\endcsname
    }%
  }

```

`\Personobjpronoun` As above, but make the first letter uppercase.

```

\newcommand*\Personobjpronoun[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter
    \MakeUppercase\csname\@gender objpronoun\endcsname
  }%
}

```

`\peopleobjpronoun` If there is more than one person, `\peopleobjpronoun` will use `\pluralobjpronoun`, otherwise it will use `\personobjpronoun`.

```

\newcommand*\peopleobjpronoun{%
  \ifnum\c@people>1\relax
    \pluralobjpronoun
  \else
    \@get@firstperson{\@thisperson}%
    \personobjpronoun[\@thisperson]%
  \fi
}

```

`\Peopleobjpronoun` As above, but first letter in upper case

```

\newcommand*\Peopleobjpronoun{%
  \ifnum\c@people>1\relax
    \expandafter\MakeUppercase\pluralobjpronoun
  \else
    \@get@firstperson{\@thisperson}%
    \Personobjpronoun[\@thisperson]%
  \fi
}

```

`\personpssadj` Display the possessive adjective (his/her) according to the person's gender.

```

\newcommand*\personpssadj[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \csname\@gender pssadj\endcsname
  }%
}

```

```
}%
}
```

`\Personpossadj` As above, but make the first letter uppercase.

```
\newcommand*{\Personpossadj}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter
    \MakeUppercase\csname\@gender possadj\endcsname
  }%
}
```

`\peoplepossadj` If there is more than one person, `\peoplepossadj` will use `\pluralpossadj`, otherwise it will use `\personpossadj`.

```
\newcommand*{\peoplepossadj}{%
  \ifnum\c@people>1\relax
    \pluralpossadj
  \else
    \@get@firstperson{\@thisperson}%
    \personpossadj[\@thisperson]%
  \fi
}
```

`\Peoplepossadj` As above, but first letter in upper case

```
\newcommand*{\Peoplepossadj}{%
  \ifnum\c@people>1\relax
    \expandafter\MakeUppercase\pluralpossadj
  \else
    \@get@firstperson{\@thisperson}%
    \Personpossadj[\@thisperson]%
  \fi
}
```

`\personposspronoun` Display possessive pronoun (his/hers) according to the person's gender.

```
\newcommand*{\personposspronoun}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \csname\@gender posspronoun\endcsname
  }%
}
```

`\Personposspronoun` As above, but make the first letter uppercase.

```

\newcommand*{\Personposspronoun}[1][anon]{%
  \ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter
    \MakeUppercase\csname\@gender posspronoun\endcsname
  }%
}

```

`\peopleposspronoun` If there is more than one person, `\peopleposspronoun` will use `\pluralposspronoun`, otherwise it will use `\personposspronoun`.

```

\newcommand*{\peopleposspronoun}{%
  \ifnum\c@people>1\relax
    \pluralposspronoun
  \else
    \@get@firstperson{\@thisperson}%
    \personposspronoun[\@thisperson]%
  \fi
}

```

`\Peopleposspronoun` As above, but first letter in upper case

```

\newcommand*{\Peopleposspronoun}{%
  \ifnum\c@people>1\relax
    \expandafter\MakeUppercase\pluralposspronoun
  \else
    \@get@firstperson{\@thisperson}%
    \Personposspronoun[\@thisperson]%
  \fi
}

```

`\personchild` Display this person's relationship to their parent (i.e. son or daughter).

```

\newcommand*{\personchild}[1][anon]{%
  \ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \csname\@gender child\endcsname
  }%
}

```

`\Personchild` As above, but make first letter uppercase.

```

\newcommand*{\Personchild}[1][anon]{%

```

```

\@ifundefined{person@#1@gender}%
{%
  \PackageError{person}{Person ‘#1’ has not been defined}{}%
}%
{%
  \edef\@gender{\csname person@#1@gender\endcsname}%
  \expandafter\expandafter\expandafter\MakeUppercase
    \csname\@gender child\endcsname
}%
}

```

`\peoplechild` If there is more than one person, `\peoplechild` will use `\malechildren` (if all male), `\femalechildren` (if all female) or `\pluralchild` (if mixed), otherwise it will use `\personchild`.

```

\newcommand*{\peoplechild}{%
  \ifnum\c@people>1\relax
    \ifallmale
      {\malechildren}%
    {\ifallfemale{\femalechildren}{\pluralchild}}%
  \else
    \@get@firstperson{\@thisperson}%
    \personchild[\@thisperson]%
  \fi
}

```

`\Peoplechild` As above but first letter is made uppercase.

```

\newcommand*{\Peoplechild}{%
  \ifnum\c@people>1\relax
    \ifallmale
      {\expandafter\MakeUppercase\malechildren}%
    {\ifallfemale
      {\expandafter\MakeUppercase\femalechildren}
      {\expandafter\MakeUppercase\pluralchild}}%
  \else
    \@get@firstperson{\@thisperson}%
    \Personchild[\@thisperson]%
  \fi
}

```

`\personparent` Display this person's relationship to their child (i.e. father or mother).

```

\newcommand*{\personparent}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \csname\@gender parent\endcsname
  }%
}

```

}

`\Personparent` As above, but make the first letter uppercase.

```
\newcommand*{\Personparent}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter\MakeUppercase
      \csname\@gender parent\endcsname
  }%
}
```

`\peopleparent` If there is more than one person, `\peopleparent` will use `\pluralparent`, otherwise it will use `\personparent`.

```
\newcommand*{\peopleparent}{%
  \ifnum\c@people>1\relax
    \pluralparent
  \else
    \@get@firstperson{\@thisperson}%
    \personparent[\@thisperson]%
  \fi
}
```

`\Peopleparent` As above, but make first letter uppercase.

```
\newcommand*{\Peopleparent}{%
  \ifnum\c@people>1\relax
    \expandafter\MakeUppercase\pluralparent
  \else
    \@get@firstperson{\@thisperson}%
    \Personparent[\@thisperson]%
  \fi
}
```

`\personsibling` Display this person's relationship to their siblings (i.e. brother or sister).

```
\newcommand*{\personsibling}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \csname\@gender sibling\endcsname
  }%
}
```

`\Personsibling` Display this person's relationship to their siblings (i.e. brother or sister).

```

\newcommand*{\Personsibling}[1][anon]{%
  \@ifundefined{person@#1@gender}%
  {%
    \PackageError{person}{Person ‘#1’ has not been defined}{}%
  }%
  {%
    \edef\@gender{\csname person@#1@gender\endcsname}%
    \expandafter\expandafter\expandafter\MakeUppercase
      \csname\@gender sibling\endcsname
  }%
}

```

`\peoplesibling` If there is more than one person, `\peoplesibling` will use `\malesiblings` (if all male), `\femalesiblings` (if all female) or `\pluralsibling` (if mixed), otherwise it will use `\personsibling`.

```

\newcommand*{\peoplesibling}{%
  \ifnum\c@people>1\relax
    \ifallmale
      {\malesiblings}%
    {\ifallfemale{\femalesiblings}{\pluralsibling}}%
  \else
    \@get@firstperson{\@thisperson}%
    \personsibling[\@thisperson]%
  \fi
}

```

`\persongender` Displays the given person's gender (`\malename` or `\femalename`).

```

\newcommand*{\persongender}[1]{%
  \ifpersonmale{#1}{\malename}{\femalename}%
}

```

9.7 Extracting Information

`\getpersongender` Gets person's gender and stores in first argument which must be a control sequence.

```

\newcommand*{\getpersongender}[2]{%
  \ifpersonmale{#2}{\let#1\malename}{\let#1\femalename}%
}

```

`\getpersonname` Gets person's name and stores in first argument which must be a control sequence.

```

\newcommand*{\getpersonname}[2]{%
  \ifpersonexists{#2}%
  {%
    \expandafter\let\expandafter#1\csname person@#2@name\endcsname
  }%
}

```

```

    {%
      \PackageError{person}{Person ‘#2’ doesn’t exist}{}%
    }%
  }

```

`\getpersonfullname` Gets person’s full name and stores in first argument which must be a control sequence.

```

\newcommand*\getpersonfullname}[2]{%
  \ifpersonexists{#2}%
  {%
    \expandafter
      \let\expandafter#1\csname person@#2@fullname\endcsname
  }%
  {%
    \PackageError{person}{Person ‘#2’ doesn’t exist}{}%
  }%
}

```

ENTRY

```

{ address
  author
  booktitle
  chapter
  edition
  editor
  howpublished
  institution
  journal
  key
  month
  note
  number
  organization
  pages
  publisher
  school
  series
  title
  type
  volume
  year
  isbn
  doi
  pubmed
  url
  abstract
  file
  eprints
}

```

```

    {}
    { label }

INTEGERS { output.state before.all mid.sentence after.sentence after.block }

FUNCTION {init.state.consts}
{ #0 'before.all :=
  #1 'mid.sentence :=
  #2 'after.sentence :=
  #3 'after.block :=
}

STRINGS { s t }

FUNCTION {output.nonnull}
{ 's :=
  output.state before.all =
  {
    "%" * write$
    newline$
  }
  { newline$
    %add.period$ " " * write$
  }

  if$
  % if$
  % mid.sentence 'output.state :=
  % }
  %if$
  s
}

FUNCTION {output}
{ duplicate$ empty$
  'pop$
  'output.nonnull
  if$
}

FUNCTION {output.check}
{ 't :=
  duplicate$ empty$
  { pop$ "empty " t * " in " * cite$ * warning$ }
  {
    output.nonnull
  }
  if$
}

```



```

FUNCTION {output.bibitem}
{ "\DTLnewbibrow" write$
  newline$
  "\DTLnewbibitem {CiteKey}{" write$
  cite$ write$
  "%}" write$
  newline$
  ""
  before.all 'output.state :=
}

FUNCTION {fin.entry}
{ "%" *
  write$
  newline$
}

FUNCTION {new.block}
{ output.state before.all =
  'skip$
  { after.block 'output.state := }
  if$
}

FUNCTION {new.sentence}
{ output.state after.block =
  'skip$
  { output.state before.all =
  'skip$
  { after.sentence 'output.state := }
  if$
  }
  if$
}

FUNCTION {not}
{ { #0 }
  { #1 }
  if$
}

FUNCTION {and}
{ 'skip$
  { pop$ #0 }
  if$
}

FUNCTION {or}
{ { pop$ #1 }

```

```

        'skip$
    if$
}

FUNCTION {new.block.checka}
{ empty$
  'skip$
  'new.block
  if$
}

FUNCTION {new.block.checkb}
{ empty$
  swap$ empty$
  and
  'skip$
  'new.block
  if$
}

FUNCTION {new.sentence.checka}
{ empty$
  'skip$
  'new.sentence
  if$
}

FUNCTION {new.sentence.checkb}
{ empty$
  swap$ empty$
  and
  'skip$
  'new.sentence
  if$
}

FUNCTION {field.or.null}
{ duplicate$ empty$
  { pop$ "" }
  'skip$
  if$
}

FUNCTION {emphasize}
{ duplicate$ empty$
  { pop$ "" }
  { "{\em " swap$ * "}" * }
  if$
}

```

```

FUNCTION {group}
{ duplicate$ empty$
  { pop$ "" }
  { "{" swap$ * "}" * }
  if$
}

INTEGERS { nameptr namesleft numnames }

FUNCTION {format.names}
{
  's :=
  #1 'nameptr :=
  s num.names$ 'numnames :=
  numnames 'namesleft :=
  { namesleft #0 > }
  {
    %s nameptr "{vv,}{ll,}{jj,}{ff}" format.name$ 't :=
    "{" *
    s nameptr "{vv}" format.name$ 't :=
    t * "}" *
    "{" *
    s nameptr "{ll}" format.name$ 't :=
    t * "{" *
    s nameptr "{jj}" format.name$ 't :=
    t * "}" *
    "{" *
    s nameptr "{ff}" format.name$ 't :=
    t * "}" *
    s nameptr "" format.name$ 't :=
    namesleft #1 >
    { "," * }
    { }
    if$
    nameptr #1 >
  {
    t *
  }
  't
  if$
  nameptr #1 + 'nameptr :=
  namesleft #1 - 'namesleft :=
  }
  while$
  "}" *
}

FUNCTION {format.authors}

```

```

{
  author empty$
  { "" }
  { author
    "\DTLnewbibitem {Author}{" write$
    format.names }
  if$
}

FUNCTION {format.editors}
{ editor empty$
  { "" }
  { editor
    "\DTLnewbibitem {Editor}{" write$
    format.names
  }
  if$
}

FUNCTION {format.title}
{ title empty$
  { "" }
  {
    "\DTLnewbibitem {Title}"
    title "t" change.case$ group *
  }
  if$
}

FUNCTION {format.howpublished}
{ howpublished empty$
  { "" }
  {
    howpublished
    "\DTLnewbibitem {HowPublished}" swap$ group *
  }
  if$
}

FUNCTION {format.organization}
{ organization empty$
  { "" }
  {
    organization
    "\DTLnewbibitem {Organization}" swap$ group *
  }
  if$
}

```

```

FUNCTION {format.institution}
{ institution empty$
  { "" }
  {
    institution
    "\DTLnewbibitem {Institution}" swap$ group *
  }
if$
}

```

```

FUNCTION {format.key}
{ key empty$
  { "" }
  {
    key
    "\DTLnewbibitem {Key}" swap$ group *
  }
if$
}

```

```

FUNCTION {format.note}
{ note empty$
  { "" }
  {
    note
    "\DTLnewbibitem {Note}" swap$ group *
  }
if$
}

```

```

FUNCTION {format.isbn}
{ isbn empty$
  { "" }
  {
    isbn
    "\DTLnewbibitem {ISBN}" swap$ group *
  }
if$
}

```

```

FUNCTION {format.doi}
{ doi empty$
  { "" }
  {
    doi
    "\DTLnewbibitem {DOI}" swap$ group *
  }
if$
}

```

```

FUNCTION {format.pubmed}
{ pubmed empty$
  { "" }
  {
    pubmed
    "\DTLnewbibitem {PubMed}" swap$ group *
  }
  if$
}

FUNCTION {format.abstract}
{ abstract empty$
  { "" }
  {
    abstract
    "\DTLnewbibitem {Abstract}" swap$ group *
  }
  if$
}

FUNCTION {format.url}
{ url empty$
  { "" }
  {
    url
    "\DTLnewbibitem {Url}" swap$ group *
  }
  if$
}

FUNCTION {format.file}
{ file empty$
  { "" }
  {
    file
    "\DTLnewbibitem {File}" swap$ group *
  }
  if$
}

FUNCTION {format.eprints}
{ eprints empty$
  { "" }
  {
    eprints
    "\DTLnewbibitem {Eprints}" swap$ group *
  }
  if$
}

```

```

}

FUNCTION {format.address}
{ address empty$
  { "" }
  {
    address
    "\DTLnewbibitem {Address}" swap$ group *
  }
  if$
}

FUNCTION {format.school}
{ school empty$
  { "" }
  {
    school
    "\DTLnewbibitem {School}" swap$ group *
  }
  if$
}

FUNCTION {format.publisher}
{ publisher empty$
  { "" }
  {
    publisher
    "\DTLnewbibitem {Publisher}" swap$ group *
  }
  if$
}

FUNCTION {n.dashify}
{ 't :=
  ""
  { t empty$ not }
  { t #1 #1 substring$ "-" =
{ t #1 #2 substring$ "--" = not
  { "--" *
    t #2 global.max$ substring$ 't :=
  }
  { { t #1 #1 substring$ "-" = }
{ "-" *
  t #2 global.max$ substring$ 't :=
}
  while$
}
  if$
}

```

```

{ t #1 #1 substring$ *
  t #2 global.max$ substring$ 't :=
}
  if$
  }
  while$
}

FUNCTION {format.date}
{ year empty$
  { month empty$
  { "" }
  { "there's a month but no year in " cite$ * warning$
    "\DTLnewbibitem {Month}" *
    month group
  }
    if$
    }
    { month empty$
  { }
  { "\DTLnewbibitem {Month}{" * month * "}" * }
    if$
    "\DTLnewbibitem {Year}{" * year * "}"
    }
    if$
  }

FUNCTION {format.btitle}
{ title
  "\DTLnewbibitem {Title}{" swap$ *
  "}" *
}

FUNCTION {tie.or.space.connect}
{ duplicate$ text.length$ #3 <
  { "~" }
  { " " }
  if$
  swap$ * *
}

FUNCTION {either.or.check}
{ empty$
  'pop$
  { "can't use both " swap$ * " fields in " * cite$ * warning$ }
  if$
}

FUNCTION {format.bvolume}

```



```

{ volume empty$
  { "" }
  {
    "\DTLnewbibitem {Volume}{" volume * "}" *
    series empty$
'skip$
{
  "\DTLnewbibitem {Series}" * series group *
  }
  if$
  "volume and number" number either.or.check
}
if$
}

FUNCTION {format.number.series}
{ volume empty$
  { number empty$
  {
    %series field.or.null group
    series empty$
    { "" }
    { "\DTLnewbibitem {Series}" * series group }
    if$
  }
  {
    "\DTLnewbibitem {Number}" number group *
    series empty$
    { "there's a number but no series in " cite$ * warning$ }
    { "\DTLnewbibitem {Series}{" * series * "}" * }
    if$
  }
  if$
  {
    { "" }
  }
  if$
}

FUNCTION {format.edition}
{ edition empty$
  { "" }
  {
    "\DTLnewbibitem {Edition}"
    edition "1" change.case$ group *
  }
  if$
}

INTEGERS { multiresult }

```

```

FUNCTION {multi.page.check}
{ 't :=
  #0 'multiresult :=
    { multiresult not
      t empty$ not
      and
    }
    { t #1 #1 substring$
      duplicate$ "-" =
      swap$ duplicate$ "," =
      swap$ "+" =
      or or
    }
  { #1 'multiresult := }
  { t #2 global.max$ substring$ 't := }
  if$
}
while$
multiresult

FUNCTION {format.pages}
{ pages empty$
  { "" }
  { pages multi.page.check
    { "\DTLnewbibitem {Pages}" pages n.dashify
      group * }
    { "\DTLnewbibitem {Pages}" pages
      group *}
    if$
  }
  if$
}

FUNCTION {format.vol.num.pages}
{
  volume empty$
  { "" }
  {
    "\DTLnewbibitem {Volume}{" volume * "}" *
  }
  if$
  number empty$
  'skip$
  { "\DTLnewbibitem {Number}{" number * "}\relax " * *
    volume empty$
  }
  { "there's a number but no volume in " cite$ * warning$ }
  'skip$
  if$
}

```

```

    }
    if$
    pages empty$
    'skip$
    { duplicate$ empty$
  { pop$ format.pages }
  { "\DTLnewbibitem {Pages}" * pages n.dashify group * }
    if$
    }
  if$
}

FUNCTION {format.chapter.pages}
{ chapter empty$
  'format.pages
  { type empty$
  { "\DTLnewbibitem {Type}{chapter}" }
  { "\DTLnewbibitem {Type}" type "1" change.case$ group *}
    if$
    "\DTLnewbibitem {Chapter}{ " * chapter * "}" *
    pages empty$
  'skip$
  { format.pages * }
    if$
  }
  if$
}

FUNCTION {format.in.ed.booktitle}
{ booktitle empty$
  { "" }
  {
    "\DTLnewbibitem {BookTitle}" booktitle group *
    editor empty$
    {}
    {
      "\DTLnewbibitem {Editor}{ " *
      editor format.names *
    }
    if$
  }
  if$
}

FUNCTION {empty.misc.check}
{ author empty$ title empty$ howpublished empty$
  month empty$ year empty$ note empty$
  and and and and and
  { "all relevant fields are empty in " cite$ * warning$ }
}

```

```

        'skip$
    if$
}

FUNCTION {format.thesis.type}
{ type empty$
  'skip$
  { pop$
    type "t" change.case$
    "\DTLnewbibitem {Type}" swap$ group *
  }
  if$
}

FUNCTION {format.tr.number}
{
  type empty$
  { "\techreportname " }
  'type
  if$
  number empty$
  { "t" change.case$ "\DTLnewbibitem {Type}" swap$ group *}
  { "\DTLnewbibitem {Type}" swap$ group *
    "\DTLnewbibitem {Number}" *
    number group * }
  if$
}

FUNCTION {format.article.crossref}
{ key empty$
  { journal empty$
  { "need key or journal for " cite$ * " to crossref " * crossref *
    warning$
    ""
  }
  {
    "\DTLnewbibitem {Journal}" journal group *
  }
  if$
  }
  {
    ""
  }
  if$
  "\DTLnewbibitem {CrossRef}{" * crossref * "}" *
}

FUNCTION {format.crossref.editor}
{ format.editors

```

```

}

FUNCTION {format.book.crossref}
{ volume empty$
  { "empty volume in " cite$ * "'s crossref of " * crossref * warning$
  }
  {
    "\DTLnewbibitem {Volume}"
    volume group *
  }
  if$
  editor empty$
  editor field.or.null author field.or.null =
  or
  { key empty$
{ series empty$
  { "need editor, key, or series for " cite$ * " to crossref " *
    crossref * warning$
    "" *
  }
  {
    "\DTLnewbibitem {Series}{" * series *
    "}" *
  }
  if$
}
{ ""
  }
  if$
  }
  {
    format.crossref.editor *
  }
  if$
  "\DTLnewbibitem {CrossRef}{" * crossref * "}" *
}

FUNCTION {format.incoll.inproc.crossref}
{ editor empty$
  editor field.or.null author field.or.null =
  or
  { key empty$
{ booktitle empty$
  { "need editor, key, or booktitle for " cite$ * " to crossref " *
    crossref * warning$
    ""
  }
  { "\DTLnewbibitem {BookTitle}{" booktitle * "}" * }
  if$

```

```

}
{ "" }
    if$
    }
    {
        "\DTLnewbibitem {Editor}{\" *
        editor format.names
    }
    if$
    "\DTLnewbibitem {CrossRef}{\" * crossref * \"}\" *
}

FUNCTION {article}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{article}%" write$
  newline$
  format.authors "author"
  output.check
  format.title "title" output.check
  new.block
  crossref missing$
  {
    "\DTLnewbibitem {Journal}\" *
    journal group "journal" output.check
    format.vol.num.pages output
    format.date "year" output.check
  }
  { format.article.crossref output.nonnull
    format.pages output
  }
  if$
  new.block
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
}

FUNCTION {book}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{book}%" write$
  newline$
  author empty$
  { format.editors "author and editor" output.check }
}

```

```

        { format.authors output.nonnull
          crossref missing$
{ "author and editor" editor either.or.check
    }
'skip$
    if$
    }
if$
new.block
format.btitle "title" output.check
crossref missing$
    { format.bvolume output
      new.block
      format.number.series output
      %new.sentence
      format.publisher "publisher" output.check
      format.address output
    }
    { new.block
      format.book.crossref output.nonnull
    }
if$
format.edition output
format.date "year" output.check
new.block
format.key output
format.note output
format.isbn output
format.doi output
format.pubmed output
format.url output
format.abstract output
format.file output
fin.entry
}

```

```

FUNCTION {booklet}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{booklet}%" write$
  newline$
  format.authors output
  new.block
  format.title "title" output.check
  howpublished address new.block.checkb
  format.howpublished output
  format.address output
  format.date output
  new.block
  format.key output

```

```

format.note output
format.isbn output
format.doi output
format.pubmed output
format.url output
format.abstract output
format.file output
fin.entry
}

FUNCTION {inbook}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{inbook}%" write$
  newline$
  author empty$
    { format.editors "author and editor" output.check }
    { format.authors output.nonnull
      crossref missing$
    { "author and editor" editor either.or.check }
    'skip$
      if$
    }
    if$
    new.block
    format.btitle "title" output.check
    crossref missing$
    { format.bvolume output
      format.chapter.pages "chapter and pages" output.check
      new.block
      format.number.series output
      new.sentence
      format.publisher "publisher" output.check
      format.address output
    }
    { format.chapter.pages "chapter and pages" output.check
      new.block
      format.book.crossref output.nonnull
    }
    if$
    format.edition output
    format.date "year" output.check
    new.block
    format.key output
    format.note output
    format.isbn output
    format.doi output
    format.pubmed output
    format.url output
    format.abstract output

```



```

format.file output
fin.entry
}

FUNCTION {incollection}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{incollection}%" write$
  newline$
  format.authors "author" output.check
  format.title "title" output.check
  crossref missing$
    { format.in.ed.booktitle "booktitle" output.check
      format.bvolume output
      format.number.series output
      format.chapter.pages output
      new.sentence
      format.publisher "publisher" output.check
      format.address output
      format.edition output
      format.date "year" output.check
    }
    { format.incoll.inproc.crossref output.nonnull
      format.chapter.pages output
    }
  }
  if$
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
}

FUNCTION {inproceedings}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{inproceedings}%" write$
  newline$
  format.authors "author" output.check
  format.title "title" output.check
  crossref missing$
    { format.in.ed.booktitle "booktitle" output.check
      format.bvolume output
      format.number.series output
      format.pages output
      address empty$
    }
  { %organization publisher new.sentence.checkb

```

```

    format.organization write$
    format.publisher output
}
{ format.address write$
  new.sentence
  format.organization output
  format.publisher output
}

    if$
    format.date "year" output.check
  }
  {
    format.incoll.inproc.crossref output.nonnull
    format.pages output
  }
  if$
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
}

FUNCTION {conference} { inproceedings }

FUNCTION {manual}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{manual}%" write$
  newline$
  author empty$
  { organization empty$
'skip$
{ format.organization output
  format.address output
}

    if$
    }
    { format.authors output }
  if$
  new.block
  format.btitle "title" output.check
  author empty$
  { organization empty$
{ address new.block.checka
  address output

```

```

}
'skip$
    if$
    }
    { %organization address new.block.checkb
      format.organization output
      format.address output
    }
    if$
    format.edition output
    format.date output
    new.block
    format.key output
    format.note output
    format.isbn output
    format.doi output
    format.pubmed output
    format.url output
    format.abstract output
    format.file output
    fin.entry
}

FUNCTION {mastersthesis}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{mastersthesis}%" write$
  newline$
  format.authors "author" output.check
  new.block
  format.title "title" output.check
  new.block
  "\DTLnewbibitem {Type}{\mscthesisname }"
  format.thesis.type output.nonnull
  format.school "school" output.check
  format.address output
  format.date "year" output.check
  new.block
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
}

FUNCTION {misc}

```

```

{ output.bibitem
  "\DTLnewbibitem {EntryType}{misc}%" write$
  newline$
  format.authors output
  title howpublished new.block.checkb
  format.title output
  %howpublished new.block.checka
  format.howpublished output
  format.date output
  new.block
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
  empty.misc.check
}

FUNCTION {phdthesis}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{phdthesis}%" write$
  newline$
  format.authors "author" output.check
  new.block
  format.btitle "title" output.check
  new.block
  "\DTLnewbibitem {Type}{\phdthesisname }"
  format.thesis.type output.nonnull
  format.school "school" output.check
  format.address output
  format.date "year" output.check
  new.block
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  fin.entry
}

FUNCTION {proceedings}
{ output.bibitem

```

```

"\DTLnewbibitem {EntryType}{proceedings}%" write$
newline$
editor empty$
  { format.organization output }
  { format.editors output.nonnull }
if$
new.block
format.btitle "title" output.check
format.bvolume output
format.number.series output
address empty$
  { editor empty$
{ publisher new.sentence.checka }
{ organization publisher new.sentence.checkb
format.organization output
}
    if$
    format.publisher output
    format.date "year" output.check
  }
  { format.address output
    format.date "year" output.check
    new.sentence
    editor empty$
'skip$
{ format.organization output }
    if$
    format.publisher output
  }
if$
new.block
format.key output
format.note output
format.isbn output
format.doi output
format.pubmed output
format.url output
format.abstract output
format.file output
fin.entry
}

FUNCTION {techreport}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{techreport}%" write$
  newline$
  format.authors "author" output.check
  new.block
  format.title "title" output.check

```

```

new.block
format.tr.number output.nonnull
format.institution "institution" output.check
format.address output
format.date "year" output.check
new.block
format.key output
format.note output
format.isbn output
format.doi output
format.pubmed output
format.url output
format.abstract output
format.file output
fin.entry
}

FUNCTION {unpublished}
{ output.bibitem
  "\DTLnewbibitem {EntryType}{unpublished}%" write$
  newline$
  format.authors "author" output.check
  new.block
  format.title "title" output.check
  new.block
  format.key output
  format.note output
  format.isbn output
  format.doi output
  format.pubmed output
  format.url output
  format.abstract output
  format.file output
  format.date output
  fin.entry
}

FUNCTION {default.type} { misc }

MACRO {jan} {"\DTLmonthname{01}"}

MACRO {feb} {"\DTLmonthname{02}"}

MACRO {mar} {"\DTLmonthname{03}"}

MACRO {apr} {"\DTLmonthname{04}"}

MACRO {may} {"\DTLmonthname{05}"}

```

```

MACRO {jun} {"\DTLmonthname{06}"}
MACRO {jul} {"\DTLmonthname{07}"}
MACRO {aug} {"\DTLmonthname{08}"}
MACRO {sep} {"\DTLmonthname{09}"}
MACRO {oct} {"\DTLmonthname{10}"}
MACRO {nov} {"\DTLmonthname{11}"}
MACRO {dec} {"\DTLmonthname{12}"}

MACRO {acmcs} {"\DTLacmcs "}
MACRO {acta} {"\DTLacta "}
MACRO {cacm} {"\DTLcacm "}
MACRO {ibmjrd} {"\DTLibmjrd "}
MACRO {ibmsj} {"\DTLibmsj "}
MACRO {ieeese} {"\DTLieeese "}
MACRO {ieeetc} {"\DTLieeetc "}
MACRO {ieeetcad} {"\DTLieeetcad "}
MACRO {ipl} {"\DTLipl "}
MACRO {jacm} {"\DTLjacm "}
MACRO {jcss} {"\DTLjcss "}
MACRO {scp} {"\DTLscp "}
MACRO {scomp} {"\DTLscomp "}
MACRO {tocs} {"\DTLtocs"}
MACRO {tods} {"\DTLtods "}
MACRO {tog} {"\DTLtog "}
MACRO {toms} {"\DTLtoms "}
MACRO {toois} {"\DTLtoois "}

```

```

MACRO {toplas} {"\DTLtoplas "}

MACRO {tcs} {"\DTLtcs "}

READ

STRINGS { longest.label }

INTEGERS { number.label longest.label.width }

FUNCTION {initialize.longest.label}
{ "" 'longest.label :=
  #1 'number.label :=
  #0 'longest.label.width :=
}

FUNCTION {longest.label.pass}
{ number.label int.to.str$ 'label :=
  number.label #1 + 'number.label :=
  label width$ longest.label.width >
    { label 'longest.label :=
      label width$ 'longest.label.width :=
    }
    'skip$
  if$
}

EXECUTE {initialize.longest.label}

ITERATE {longest.label.pass}

FUNCTION {begin.bib}
{ preamble$ empty$
  'skip$
  { preamble$ write$ newline$ }
  if$
}

EXECUTE {begin.bib}

EXECUTE {init.state.consts}

ITERATE {call.type$}

FUNCTION {end.bib}
{
}

```


EXECUTE {end.bib}

Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the definition; numbers in *roman* refer to the pages where the entry is used.

Symbols	
\@dtl@set@off	<u>257</u>
\@dtl@setnull	<u>101</u>
\@dtl@setoffr	<u>257</u>
\@DTLforeach	<u>118</u>
\@DTLforeachbibentry	<u>184</u>
\@DTLifdbempty	<u>87</u>
\@DTLifhaskey	<u>88</u>
\@DTLnewdbentry	<u>98</u>
\@DTLnewrow	<u>87</u>
\@DTLremoveover	<u>146</u>
\@DTLsetheader	<u>96</u>
\@DTLsort	<u>158</u>
\@dtl@activatebraces	<u>179</u>
\@dtl@after	<u>93</u>
\@dtl@assign	<u>100</u>
\@dtl@assigncmd	<u>100</u>
\@dtl@assigncmdnoop	<u>101</u>
\@dtl@barcount	<u>228</u>
\@dtl@before	<u>93</u>
\@dtl@checknumerical	<u>37</u>
\@dtl@checknumericalloop	<u>39</u>
\@dtl@checknumericalnoop	<u>40</u>
\@dtl@checknumericalstart	<u>37</u>
\@dtl@chop@trailingzeroes	<u>11</u>
\@dtl@choptrailingzeroes	<u>11</u>
\@dtl@colhead	<u>93</u>
\@dtl@construct@getintfrac	<u>9</u>
\@dtl@construct@getnums	<u>10</u>
\@dtl@construct@lop@ff	<u>83</u>
\@dtl@construct@lopoff	<u>82</u>
\@dtl@construct@lopoffs	<u>83</u>
\@dtl@construct@qlopoff	<u>82</u>
\@dtl@construct@stripnumgrpchar	<u>13</u>
\@dtl@countdigits	<u>14</u>
\@dtl@currencies	<u>16</u>
\@dtl@currency	<u>17</u>
\@dtl@datatype	<u>36</u>
\@dtl@decimal	<u>9</u>
\@dtl@decimal@to@localeint ...	<u>14</u>
\@dtl@decimaltolocale	<u>13</u>
\@dtl@decimaltolocalefrac ...	<u>14</u>
\@dtl@decimaltolocaleint	<u>13</u>
\@dtl@decrementrows	<u>144</u>
\@dtl@delimiter	<u>81</u>
\@dtl@dosubstitute	<u>36</u>
\@dtl@dosubstitutenoop	<u>36</u>
\@dtl@elements	<u>148</u>
\@dtl@forcolnoop	<u>116</u>
\@dtl@foreach@level	<u>70</u>
\@dtl@foreachkey	<u>113</u>
\@dtl@foreachnoop	<u>112</u>
\@dtl@foreachrow	<u>111</u>
\@dtl@get@int@part	<u>11</u>
\@dtl@get@intpart	<u>10</u>
\@dtl@get@next@intpart	<u>11</u>
\@dtl@get@sortdirection	<u>165</u>
\@dtl@getcolumnindex	<u>89</u>
\@dtl@getdatatype	<u>92</u>
\@dtl@getkeyforcolumn	<u>91</u>
\@dtl@getprops	<u>93</u>
\@dtl@getsortdirection	<u>164</u>
\@dtl@gobbletonil	<u>12</u>
\@dtl@ifDigitOrDecimalSep	<u>38</u>
\@dtl@ifsingle	<u>3</u>
\@dtl@initials	<u>30</u>
\@dtl@list	<u>158</u>
\@dtl@mathprocessor	<u>2</u>
\@dtl@numbergroupchar	<u>9</u>
\@dtl@numgrpsepcount	<u>9</u>
\@dtl@rawmappings	<u>179</u>
\@dtl@rawread	<u>178</u>
\@dtl@read	<u>170</u>

<code>\@dtl@readline</code>	171	<code>\@sdtlgetdatatype</code>	92
<code>\@dtl@readrawline</code>	171	<code>\@sdtlgetkeydata</code>	103
<code>\@dtl@resetdostartrow</code>	139	<code>\@sdtlgetkeyforcolumn</code>	90
<code>\@dtl@rowa</code>	159		
<code>\@dtl@rowb</code>	159	A	
<code>\@dtl@seg</code>	257	<code>\addfemalelabel</code>	284
<code>\@dtl@separator</code>	81	<code>\addmalelabel</code>	283
<code>\@dtl@set@off</code>	257	amsmath package	4
<code>\@dtl@setheaderforindex</code>	97	<code>\andname</code>	182 , 290
<code>\@dtl@setnull</code>	101		
<code>\@dtl@sortcriteria</code>	162	C	
<code>\@dtl@standardize@currency</code> ...	16	counters:	
<code>\@dtl@starttrim</code>	177	DTLbarroundvar	227
<code>\@dtl@strip@numgrpchar</code>	12	DTLbibrow	185
<code>\@dtl@subnobrsp</code>	29	DTLmaxauthors	188
<code>\@dtl@tmpcount</code>	3	DTLmaxeditors	189
<code>\@dtl@toks</code>	3	DTLpieroundvar	249
<code>\@dtl@toksA</code>	165	DTLplotroundvar	261
<code>\@dtl@toksB</code>	165	DTLplotroundYvar	261
<code>\@dtl@trim</code>	177	people	283
<code>\@dtl@truncatedecimal</code>	12	person	283
<code>\@dtl@updatefkcs</code>	113		
<code>\@dtl@updatekeys</code>	93	D	
<code>\@dtl@write</code>	167	dataplot package	226
<code>\@dtlforcolumn</code>	114	datatool package	2 , 181
<code>\@dtlforeachrow</code>	111	datatool-base package	72 , 77
<code>\@dtlgetdatatype</code>	92	datatool-fp package	2
<code>\@dtlgetkeydata</code>	103	delimiter (option)	83
<code>\@dtlgetkeyforcolumn</code>	90	<code>\dtl@abbrvmonthname</code>	201
<code>\@dtlgetrow</code>	104	<code>\dtl@authorcount</code>	188
<code>\@dtlifreadonly</code>	126	<code>\dtl@chopfirst</code>	6
<code>\@dtlloaddb</code>	172	<code>\dtl@choplast</code>	5
<code>\@dtlmaxforkeys</code>	155	<code>\dtl@citex</code>	223
<code>\@dtlmeanforkeys</code>	148 , 150	<code>\dtl@compare@</code>	165
<code>\@dtlminforkeys</code>	153	<code>\dtl@computeangles</code>	256
<code>\@dtlnovalue</code>	102	<code>\dtl@constructminorticklist</code> .	280
<code>\@dtlsdforkeys</code>	152	<code>\dtl@constructticklist</code>	278
<code>\@dtlsumforkeys</code>	147	<code>\dtl@constructticklistwithgap</code>	279
<code>\@get@firstperson</code>	283	<code>\dtl@constructticklistwithgapex</code>	281
<code>\@people@list</code>	283	<code>\dtl@constructticklistwithgapz</code>	280
<code>\@sDTLforeach</code>	123	<code>\dtl@createalphabiblabels</code> ...	219
<code>\@sDTLforeachbibentry</code>	184	<code>\dtl@cutawayoffset</code>	249
<code>\@sDTLifhaskey</code>	88	<code>\dtl@decrementrows</code>	144
<code>\@sDTLnewdbentry</code>	98	<code>\dtl@domappings</code>	179
<code>\@sDTLnewrow</code>	87	<code>\dtl@entrycr</code>	170
<code>\@sDTLsetheader</code>	97	<code>\dtl@gathervalues</code>	103
<code>\@sDTLsort</code>	159	<code>\dtl@getbounds</code>	278
<code>\@sdtlforcolumn</code>	114	<code>\dtl@getentryfromrow</code>	108
<code>\@sdtlforcolumnidx</code>	115		

<code>\dtl@getfirst</code>	<u>46</u>	<code>\dtl@testiopenbetween</code>	<u>65</u>
<code>\dtl@getvalue</code>	<u>110</u>	<code>\dtl@testlt</code>	<u>62</u>
<code>\dtl@ifsingle</code>	<u>3</u>	<code>\dtl@testnumclosedbetween</code>	<u>63</u>
<code>\dtl@initials</code>	<u>30</u>	<code>\dtl@testnumerical</code>	<u>68</u>
<code>\dtl@initialshyphen</code>	<u>30</u>	<code>\dtl@testnumopenbetween</code>	<u>64</u>
<code>\dtl@innerlabel</code>	<u>249</u>	<code>\dtl@testopenbetween</code>	<u>65</u>
<code>\dtl@inneroffset</code>	<u>249</u>	<code>\dtl@testreal</code>	<u>68</u>
<code>\dtl@insertinto</code>	<u>7</u>	<code>\dtl@teststartswith</code>	<u>55</u>
<code>\dtl@legendsetting</code>	<u>262</u>	<code>\dtl@teststring</code>	<u>67</u>
<code>\dtl@listgetalphalabel</code>	<u>220</u>	<code>\dtl@tmplength</code>	<u>3</u>
<code>\dtl@message</code>	<u>3</u>	<code>\dtl@trim</code>	<u>177</u>
<code>\dtl@monthname</code>	<u>200</u>	<code>\dtl@truncatedecimal</code>	<u>12</u>
<code>\dtl@outerlabel</code>	<u>249</u>	<code>\dtl@xticlabelheight</code>	<u>261</u>
<code>\dtl@outeroffset</code>	<u>249</u>	<code>\dtl@yticlabelwidth</code>	<u>261</u>
<code>\dtl@piecutaways</code>	<u>249</u>	<code>\DTLabs</code>	<u>20</u>
<code>\dtl@setcharcode</code>	<u>46</u>	<code>\dtlabs</code>	<u>76, 80</u>
<code>\dtl@setlccharcode</code>	<u>47</u>	<code>\DTLacmcs</code>	<u>202</u>
<code>\dtl@sortdata</code>	<u>159</u>	<code>\DTLacta</code>	<u>203</u>
<code>\dtl@sortlist</code>	<u>6</u>	<code>\DTLadd</code>	<u>17</u>
<code>\dtl@sortresult</code>	<u>8</u>	<code>\dtladd</code>	<u>74, 78</u>
<code>\dtl@subnobrsp</code>	<u>29</u>	<code>\dtladdalign</code>	<u>135</u>
<code>\dtl@test@ifalllowercase</code>	<u>34</u>	<code>\DTLaddall</code>	<u>18</u>
<code>\dtl@test@ifalluppercase</code>	<u>32</u>	<code>\DTLaddcomma</code>	<u>187</u>
<code>\dtl@testbibfieldcontains</code> ...	<u>200</u>	<code>\DTLaddentryforrow</code>	<u>131</u>
<code>\dtl@testbibfieldexists</code>	<u>197</u>	<code>\DTLaddperiod</code>	<u>187</u>
<code>\dtl@testbibfielddiseq</code>	<u>197</u>	<code>\DTLaddtoplotlegend</code>	<u>281</u>
<code>\dtl@testbibfielddisge</code>	<u>199</u>	<code>\dtlaftercols</code>	<u>134</u>
<code>\dtl@testbibfielddisgt</code>	<u>199</u>	<code>\DTLafterinitialbeforehyphen</code> .	<u>31</u>
<code>\dtl@testbibfielddisle</code>	<u>198</u>	<code>\DTLafterinitials</code>	<u>31</u>
<code>\dtl@testbibfielddislt</code>	<u>197</u>	<code>\dtlafterrow</code>	<u>104</u>
<code>\dtl@testbothnumerical</code>	<u>42</u>	<code>\DTLandlast</code>	<u>188</u>
<code>\dtl@testclosedbetween</code>	<u>64</u>	<code>\DTLandnotlast</code>	<u>188</u>
<code>\dtl@testcurrency</code>	<u>68</u>	<code>\dtlappendentrytocurrentrow</code> .	<u>108</u>
<code>\dtl@testcurrencyunit</code>	<u>68</u>	<code>\DTLappendtorow</code>	<u>126</u>
<code>\dtl@testeq</code>	<u>63</u>	<code>\DTLassign</code>	<u>100</u>
<code>\dtl@testFPiseq</code>	<u>66</u>	<code>\DTLbaratbegintikz</code>	<u>228</u>
<code>\dtl@testFPisgt</code>	<u>66</u>	<code>\DTLbaratendtikz</code>	<u>228</u>
<code>\dtl@testFPisgteq</code>	<u>67</u>	<code>\DTLbarchart</code>	<u>232</u>
<code>\dtl@testFPisl</code>	<u>65</u>	<code>\DTLbarchartlength</code>	<u>227</u>
<code>\dtl@testFPislteq</code>	<u>67</u>	<code>\DTLbardisplayYticklabel</code>	<u>227</u>
<code>\dtl@testgt</code>	<u>62</u>	<code>\DTLbarlabeloffset</code>	<u>227</u>
<code>\dtl@testiceq</code>	<u>63</u>	<code>\DTLbaroutlinecolor</code>	<u>229</u>
<code>\dtl@testicgt</code>	<u>62</u>	<code>\DTLbaroutlinewidth</code>	<u>229</u>
<code>\dtl@testiclosedbetween</code>	<u>64</u>	<code>\DTLbarroundvar (counter)</code>	<u>227</u>
<code>\dtl@testiclt</code>	<u>62</u>	<code>\DTLbarwidth</code>	<u>227</u>
<code>\dtl@testifalllowercase</code>	<u>33</u>	<code>\DTLBarXAxisStyle</code>	<u>227</u>
<code>\dtl@testifalluppercase</code>	<u>31</u>	<code>\DTLBarYAxisStyle</code>	<u>227</u>
<code>\dtl@testifsubstring</code>	<u>54</u>	<code>\dtlbeforecols</code>	<u>134</u>
<code>\dtl@testint</code>	<u>68</u>	<code>\dtlbeforerow</code>	<u>104</u>

<code>\dtlbetweencols</code>	134	<code>\dtldisplaystartrow</code>	136
<code>\DTLbetweeninitials</code>	31	<code>\dtldisplaystarttab</code>	136
<code>\dtlbib@style</code>	181	<code>\DTLdisplayupperbarlabel</code>	228
<code>\DTLbibfield</code>	185	<code>\DTLdisplayuppermultibarlabel</code>	228
<code>\DTLbibfieldcontains</code>	200	<code>\DTLdiv</code>	19
<code>\DTLbibfieldexists</code>	196	<code>\dtldiv</code>	75, 79
<code>\DTLbibfielddiseq</code>	197	<code>\DTLdobarcolor</code>	229
<code>\DTLbibfielddisge</code>	199	<code>\DTLdocurrentbarcolor</code>	229
<code>\DTLbibfielddisgt</code>	198	<code>\DTLdocurrentpiesegmentcolor</code>	251
<code>\DTLbibfielddisle</code>	198	<code>\DTLdopiesegmentcolor</code>	251
<code>\DTLbibfielddislt</code>	197	<code>\DTLendbibitem</code>	183
<code>\DTLbibitem</code>	201	<code>DTLenvforeach (environment)</code> ...	118
<code>\DTLbibliography</code>	183	<code>DTLenvforeach* (environment)</code> ..	118
<code>\DTLbibliographystyle</code>	222	<code>dtlenvgforint (environment)</code>	71
<code>DTLbibrow (counter)</code>	185	<code>\DTLeverybarhook</code>	230
<code>\dtlbreak</code>	69	<code>\dtlexpandnewvalue</code>	98
<code>\dtlbst@abbrv</code>	217	<code>\dtlforcolumm</code>	114
<code>\dtlbst@alpha</code>	218	<code>\DTLforeach</code>	118
<code>\dtlbst@plain</code>	204	<code>\DTLforeachbibentry</code>	184
<code>\DTLcacr</code>	203	<code>\dtlforeachkey</code>	112
<code>\DTLcheckbibfieldendsperiod</code> .	186	<code>\DTLforeachkeyinrow</code>	132
<code>\DTLcheckendsperiod</code>	186	<code>\dtlforeachlevel</code>	117
<code>\DTLcite</code>	223	<code>\dtlforint</code>	69
<code>\DTLcleardb</code>	85	<code>\DTLformatabbrvforenames</code>	191
<code>\DTLclip</code>	28	<code>\DTLformatarticle</code>	202
<code>\dtlclip</code>	75, 79	<code>\DTLformatarticlecrossref</code> ...	196
<code>\DTLcolumncount</code>	86	<code>\DTLformatauthor</code>	201
<code>\dtlcolumnindex</code>	90	<code>\DTLformatauthorlist</code>	188
<code>\dtlcolumnnum</code>	88	<code>\DTLformatbibentry</code>	183
<code>\dtlcompare</code>	43	<code>\DTLformatbook</code>	202
<code>\DTLcomputebounds</code>	156	<code>\DTLformatbookcrossref</code>	194
<code>\DTLcomputewidestbibentry</code> ...	184	<code>\DTLformatbooklet</code>	202
<code>\DTLconverttodecimal</code>	9	<code>\DTLformatbvolume</code>	193
<code>\dtlcurrencyalign</code>	135	<code>\DTLformatchapterpages</code>	193
<code>\dtlcurrencyformat</code>	136	<code>\DTLformatcrossrefeditor</code>	192
<code>\DTLcurrencytype</code>	91	<code>\DTLformatdate</code>	195
<code>\dtlcurrentrow</code>	104	<code>\DTLformatedition</code>	202
<code>\DTLcutawayratio</code>	249	<code>\DTLformateditor</code>	201
<code>\DTLdecimaltolocale</code>	13	<code>\DTLformateditorlist</code>	189
<code>\dtldefaultkey</code>	171	<code>\DTLformatforenames</code>	190
<code>\DTLdeletedb</code>	86	<code>\DTLformatinbook</code>	202
<code>\dtldisplayafterhead</code>	136	<code>\DTLformatincollection</code>	202
<code>\DTLdisplaydb</code>	137	<code>\DTLformatincolproccrossref</code>	194
<code>\dtldisplayendtab</code>	136	<code>\DTLformatinedbooktitle</code>	195
<code>\DTLdisplayinnerlabel</code>	250	<code>\DTLformatinproceedings</code>	202
<code>\DTLdisplaylongdb</code>	139	<code>\DTLformatjr</code>	191
<code>\DTLdisplaylowerbarlabel</code>	227	<code>\DTLformatlegend</code>	262
<code>\DTLdisplaylowermultibarlabel</code>	227	<code>\DTLformatmanual</code>	202
<code>\DTLdisplayouterlabel</code>	250	<code>\DTLformatmastersthesis</code>	202

\DTLformatmisc	202	\DTLIEEEetcad	203
\DTLformatnumberseries	193	\DTLifAllLowerCase	33
\DTLformatpages	193	\DTLifAllUpperCase	31
\DTLformatphdthesis	202	\DTLifanybibfieldexists	185
\DTLformatproceedings	202	\DTLifbibfieldexists	185
\DTLformatsurname	191	\DTLifcasedatatype	41
\DTLformatsurnameonly	190	\DTLifclosedbetween	58
\DTLformattechreport	202	\DTLifcurrency	41
\DTLformatunpublished	202	\DTLifcurrencyunit	41
\DTLformatvolnumpages	192	\DTLifdbempty	86
\DTLformatvon	191	\DTLifdbexists	100
\DTLgabs	21	\DTLifeq	53
\DTLgadd	17	\DTLiffirstrow	133
\DTLgaddall	18	\DTLifFPclosedbetween	61
\DTLgclip	28	\DTLifFPopenbetween	61
\DTLgdiv	20	\DTLifgt	52
\DTLgetbarcolor	228	\DTLifhaskey	88
\DTLgetcolumnindex	89	\DTLifinlist	4
\DTLgetdatatype	91	\DTLifint	40
\dtlgetentryfromcurrentrow ..	108	\DTLiflastrow	134
\dtlgetentryfromrow	108	\DTLiflt	50
\DTLgetkeydata	102	\DTLifnull	102
\DTLgetkeyforcolumn	90	\DTLifnumclosedbetween	57
\DTLgetlocation	110	\dtlifnumclosedbetween	74, 78
\DTLgetpiesegmentcolor	250	\DTLifnumeq	52
\dtlgetrow	104	\dtlifnumeq	72, 77
\DTLgetrowforkey	157	\DTLifnumerical	40
\DTLgetvalue	109	\DTLifnumgt	51
\DTLgetvalueforkey	157	\dtlifnumgt	73, 78
\dtlgforint	70	\DTLifnumlt	42
\DTLgmax	23	\dtlifnumlt	73, 77
\DTLgmaxall	24	\DTLifnumopenbetween	59
\DTLgmeanforall	25	\dtlifnumopenbetween	73, 78
\DTLgmin	22	\DTLifoddrow	134
\DTLgminall	23	\DTLifopenbetween	60
\DTLgmul	19	\DTLifreal	40
\DTLgneg	21	\DTLifStartsWith	55
\DTLground	27	\DTLifstring	41
\DTLgsdforall	27	\DTLifstringclosedbetween	57
\DTLgsqrt	21	\DTLifstringeq	53
\DTLgsub	19	\DTLifstringgt	51
\DTLgtrunc	28	\DTLifstringlt	50
\DTLgvarianceforall	26	\DTLifstringopenbetween	59
\dtlheaderformat	136	\DTLifSubString	54
\DTLibmjrd	203	\DTLinitialhyphen	31
\DTLibmsj	203	\DTLinitals	28
\dtlicompare	48	\DTLinnerratio	249
\DTLIEEE	203	\dtlintalign	134
\DTLIEEEetc	203	\dtlintformat	136

<code>\DTLinttype</code>	<u>91</u>	<code>\DTLmeanforkeys</code>	<u>148</u>
<code>\DTLipl</code>	<u>203</u>	<code>\DTLmin</code>	<u>22</u>
<code>\DTLisclosedbetween</code>	<u>64</u>	<code>\dtlmin</code>	<u>75, 79</u>
<code>\DTLiscurrency</code>	<u>68</u>	<code>\DTLminall</code>	<u>22</u>
<code>\DTLiscurrencyunit</code>	<u>68</u>	<code>\DTLminforcolumn</code>	<u>154</u>
<code>\DTLiseq</code>	<u>63</u>	<code>\DTLminforkeys</code>	<u>153</u>
<code>\DTLisFPclosedbetween</code>	<u>65</u>	<code>\DTLminminortickgap</code>	<u>261</u>
<code>\DTLisFPeq</code>	<u>66</u>	<code>\DTLminorgridstyle</code>	<u>262</u>
<code>\DTLisFPgt</code>	<u>66</u>	<code>\DTLminorticklength</code>	<u>260</u>
<code>\DTLisFPgteq</code>	<u>67</u>	<code>\DTLmintickgap</code>	<u>261</u>
<code>\DTLisFPlt</code>	<u>66</u>	<code>\DTLmonthname</code>	<u>200</u>
<code>\DTLisFPlteq</code>	<u>67</u>	<code>\DTLmul</code>	<u>19</u>
<code>\DTLisFPopenbetween</code>	<u>65</u>	<code>\dtlmul</code>	<u>75, 79</u>
<code>\DTLisgt</code>	<u>62</u>	<code>\DTLmultibarchart</code>	<u>239</u>
<code>\DTLisiclosedbetween</code>	<u>64</u>	<code>\DTLmultibibs</code>	<u>222</u>
<code>\DTLisieq</code>	<u>63</u>	<code>\DTLneg</code>	<u>21</u>
<code>\DTLisigt</code>	<u>63</u>	<code>\dtlneg</code>	<u>76, 80</u>
<code>\DTLisilt</code>	<u>62</u>	<code>\DTLnewbibitem</code>	<u>182</u>
<code>\DTLisint</code>	<u>68</u>	<code>\DTLnewbibrow</code>	<u>181</u>
<code>\DTLisiopenbetween</code>	<u>65</u>	<code>\DTLnewcurrencysymbol</code>	<u>16</u>
<code>\DTLislt</code>	<u>62</u>	<code>\DTLnewdb</code>	<u>85</u>
<code>\DTLisnumclosedbetween</code>	<u>64</u>	<code>\DTLnewdbentry</code>	<u>98</u>
<code>\DTLisnumerical</code>	<u>68</u>	<code>\DTLnewrow</code>	<u>87</u>
<code>\DTLisnumopenbetween</code>	<u>64</u>	<code>\DTLnocite</code>	<u>224</u>
<code>\DTLisopenbetween</code>	<u>65</u>	<code>\dtlnoexpandnewvalue</code>	<u>98</u>
<code>\DTLisPrefix</code>	<u>63</u>	<code>\dtlnovalue</code>	<u>102</u>
<code>\DTLisreal</code>	<u>68</u>	<code>\DTLnumbernull</code>	<u>102</u>
<code>\DTLisstring</code>	<u>67</u>	<code>\DTLnumitemsinlist</code>	<u>5</u>
<code>\DTLisSubString</code>	<u>63</u>	<code>\DTLouterratio</code>	<u>249</u>
<code>\DTLjacm</code>	<u>203</u>	<code>\DTLpar</code>	<u>84</u>
<code>\DTLjcss</code>	<u>203</u>	<code>\DTLpieatbegintikz</code>	<u>250</u>
<code>\DTLlegendxoffset</code>	<u>262</u>	<code>\DTLpieatendtikz</code>	<u>250</u>
<code>\DTLlegandyoffset</code>	<u>262</u>	<code>\DTLpiechart</code>	<u>253</u>
<code>\DTLloadbbl</code>	<u>181</u>	<code>\DTLpieoutlinecolor</code>	<u>251</u>
<code>\DTLloaddb</code>	<u>172</u>	<code>\DTLpieoutlinewidth</code>	<u>251</u>
<code>\DTLloadmbbl</code>	<u>224</u>	<code>\DTLpiepercent</code>	<u>250</u>
<code>\DTLloadrawdb</code>	<u>177</u>	<code>\DTLpieroundvar (counter)</code>	<u>249</u>
<code>\DTLmajorgridstyle</code>	<u>262</u>	<code>\DTLplot</code>	<u>267</u>
<code>\DTLmax</code>	<u>23</u>	<code>\DTLplotatbegintikz</code>	<u>263</u>
<code>\dtlmax</code>	<u>75, 79</u>	<code>\DTLplotatendtikz</code>	<u>263</u>
<code>\DTLmaxall</code>	<u>23</u>	<code>\DTLplotheight</code>	<u>260</u>
<code>\DTLmaxauthors (counter)</code>	<u>188</u>	<code>\DTLplotlinecolors</code>	<u>260</u>
<code>\DTLmaxeditors (counter)</code>	<u>189</u>	<code>\DTLplotlines</code>	<u>260</u>
<code>\DTLmaxforcolumn</code>	<u>155</u>	<code>\DTLplotmarkcolors</code>	<u>259</u>
<code>\DTLmaxforkeys</code>	<u>154</u>	<code>\DTLplotmarks</code>	<u>259</u>
<code>\DTLmbibitem</code>	<u>201</u>	<code>\DTLplotroundvar (counter)</code>	<u>261</u>
<code>\DTLmbibliography</code>	<u>225</u>	<code>\DTLplotroundYvar (counter)</code>	<u>261</u>
<code>\DTLmeanforall</code>	<u>24</u>	<code>\DTLplotstream</code>	<u>259</u>
<code>\DTLmeanforcolumn</code>	<u>149</u>	<code>\DTLplotwidth</code>	<u>260</u>

<code>\femalename</code>	291	<code>\iffemalelabel</code>	284
<code>\femaleobjpronoun</code>	289	<code>\ifmale</code>	286
<code>\femaleparent</code>	290	<code>\iffemalelabel</code>	284
<code>\femalepossadj</code>	289	<code>\ifpersonexists</code>	286
<code>\femaleposspronoun</code>	289	<code>ifthen package</code>	283
<code>\femalepronoun</code>	289	<code>\inname</code>	182
<code>\femalesibling</code>	290	L	
<code>\femalesiblings</code>	290	<code>\long@addto@envbody</code>	4
<code>\foreachperson</code>	288	<code>\long@collect@@body</code>	4
<code>fp package</code>	2, 9, 17, 72, 83	<code>\long@collect@body</code>	4
G		<code>\long@push@begins</code>	4
<code>\getpersonfullname</code>	300	<code>longtable (environment)</code> ...	134, 140
<code>\getpersongender</code>	299	<code>longtable package</code>	139
<code>\getpersonname</code>	299	M	
H		<code>\malechild</code>	290
<code>hyperref package</code>	117, 118, 123, 185	<code>\malechildren</code>	290
I		<code>\malelabels</code>	283
<code>\if@dtl@condition</code>	36	<code>\malename</code>	290
<code>\if@dtl@insertdone</code>	8	<code>\maleobjpronoun</code>	289
<code>\if@dtl@numgrpsep</code>	38	<code>\maleparent</code>	290
<code>\ifallfemale</code>	287	<code>\malepossadj</code>	289
<code>\ifallmale</code>	287	<code>\maleposspronoun</code>	289
<code>\ifDTLbarxaxis</code>	228	<code>\malepronoun</code>	289
<code>\ifDTLbaryaxis</code>	228	<code>\malesibling</code>	290
<code>\ifDTLbarytics</code>	228	<code>\malesiblings</code>	290
<code>\ifDTLbox</code>	264	<code>math (option)</code>	2, 83
<code>\ifDTLcolorbarchart</code>	226	<code>\mscthesisname</code>	182
<code>\ifDTLcolorpiechart</code>	248	N	
<code>\ifDTLgrid</code>	265	<code>\newperson</code>	284
<code>\ifDTLmidsentence</code>	187	<code>\numbername</code>	182
<code>\ifdtlnoheader</code>	170	O	
<code>\ifDTLperiod</code>	186	<code>\ofname</code>	182
<code>\ifDTLrotateinner</code>	248	P	
<code>\ifDTLrotateouter</code>	248	<code>package options:</code>	
<code>\ifDTLshowlines</code>	262	<code>delimiter</code>	83
<code>\ifDTLshowmarkers</code>	262	<code>math</code>	2, 83
<code>\ifDTLstartsentence</code>	187	<code>separator</code>	83
<code>\ifDTLverticalbars</code>	226	<code>style</code>	
<code>\ifDTLxaxis</code>	261	<code> databib</code>	181
<code>\ifDTLxminortics</code>	265	<code>verbose</code>	2, 72
<code>\ifDTLxticsin</code>	262	<code>verbose</code>	2, 72, 83
<code>\ifDTLxticstrue</code>	264	<code>\pagename</code>	182
<code>\ifDTLyaxis</code>	261	<code>\pagesname</code>	182
<code>\ifDTLyminortics</code>	265	<code>people (counter)</code>	283
<code>\ifDTLyticsin</code>	262	<code>\Peoplechild</code>	297
<code>\ifDTLyticstrue</code>	264		
<code>\iffemale</code>	287		

<code>\peoplechild</code>	297	<code>pgfmath package</code>	2, 17, 77, 83
<code>\peoplefullname</code>	291	<code>\phdthesisname</code>	182
<code>\peoplename</code>	292	<code>\pluralchild</code>	290
<code>\Peopleobjpronoun</code>	294	<code>\pluralobjpronoun</code>	289
<code>\peopleobjpronoun</code>	294	<code>\pluralparent</code>	290
<code>\Peopleparent</code>	298	<code>\pluralpossadj</code>	289
<code>\peopleparent</code>	298	<code>\pluralposspronoun</code>	290
<code>\Peoplepossadj</code>	295	<code>\pluralpronoun</code>	289
<code>\peoplepossadj</code>	295	<code>\pluralsibling</code>	290
<code>\Peopleposspronoun</code>	296		
<code>\peopleposspronoun</code>	296	R	
<code>\Peoplepronoun</code>	293	<code>\removeallpeople</code>	286
<code>\peoplepronoun</code>	293	<code>\removepeople</code>	286
<code>\peoplesibling</code>	299	<code>\removeperson</code>	285
<code>person (counter)</code>	283		
<code>\Personchild</code>	296	S	
<code>\personchild</code>	296	<code>separator (option)</code>	83
<code>\personfullname</code>	291	<code>substr package</code>	2
<code>\persongender</code>	299		
<code>\personlastsep</code>	291	T	
<code>\personname</code>	292	<code>tabular (environment)</code> ..	119, 123, 134
<code>\Personobjpronoun</code>	294	<code>\techreportname</code>	182
<code>\personobjpronoun</code>	293	<code>\theHDTLbibrow</code>	185
<code>\Personparent</code>	298	<code>tikzpicture (environment)</code>	
<code>\personparent</code>	297	228, 250, 263, 267
<code>\Personpossadj</code>	295	<code>\toks@gconcat@middle@cx</code>	8
<code>\Personposspronoun</code>	296	<code>\toks@gput@right@cx</code>	8
<code>\personposspronoun</code>	295	<code>\twopeoplesep</code>	291
<code>\Personpronoun</code>	293		
<code>\personpronoun</code>	292	V	
<code>\personpssadj</code>	294	<code>verbose (option)</code>	2, 72, 83
<code>\personsep</code>	291	<code>\volumename</code>	182
<code>\Personsibling</code>	299		
<code>\personsibling</code>	298	X	
		<code>xkeyval package</code>	226, 248

Change History

1.01		
\@dtl@checknumericalloop:		\DTLisilt:new 62
fixed bug caused by com-		\DTLisiopenbetween:new 65
mands occurring within text		\DTLisPrefix:new 63
being tested 39		\DTLisSubString:new 63
\@dtl@ifDigitOrDecimalSep:		\DTLmaxall: removed extraneous
new 38		space 23
\DTLaddall: removed extraneous		\DTLmeanforall: removed extra-
space 18		neous space 24
\DTLbarchart: uses \@sDTLforeach		\DTLminall: removed extraneous
instead of \DTLforeach ... 232		space 22
\dtlcompare: replaces \compare		\DTLmultibarchart: uses
(no longer using compare.tex) 44		\@sDTLforeach instead of
\DTLforeach: added starred ver-		\DTLforeach 239
sion 118		\DTLmultibibs:new 223
\DTLgetrowforkey:new 157		\DTLpiechart: uses \@sDTLforeach
\DTLgetvalueforkey:new ... 157		instead of \DTLforeach ... 253
\dtlicompare:new 48		\DTLplot: uses \@sDTLforeach
\DTLifclosedbetween: added		instead of \DTLforeach ... 276
starred version 58		\DTLplotstream: uses \@sDTLforeach
\DTLifeq: added starred version 53		instead of \DTLforeach ... 259
\DTLifgt: added starred version 52		\DTLremovecurrentrow: fix bug
\DTLiflastrow: fixed bug 134		caused by missing \fi and un-
\DTLiflt: added starred version 50		required argument 131
\DTLifopenbetween: added		\DTLsdforall: fixed bug 26
starred version 60		removed extraneous space ... 26
\DTLifStartsWith:new 55		\DTLsort: added optional argu-
\DTLifstringclosedbetween:		ment 158
added starred version 57		added starred version 158
\DTLifstringeq: added starred		\DTLsplitstring:new 35
version 53		\DTLstoreinitials: now uses
\DTLifstringgt: added starred		\DTLinitialhyphen 29
version 51		now works with unbreakable
\DTLifstringlt: added starred		space symbol 29
version 50		\DTLsubstituteall: fixed bug
\DTLifstringopenbetween:		caused when certain com-
added starred version 59		mands occur in the string ... 36
\DTLifSubString:new 54		\DTLvarianceforall: fixed bug 25
\DTLinitialhyphen:new 31		removed extraneous space ... 25
\DTLinitials: now uses		
\DTLinitialhyphen 28	1.03	\DTLnewbibitem: removed check
now works with unbreakable		if database exists 182
space symbol 28		\DTLnewbibrow: removed check if
\DTLisiclosedbetween:new .. 64		database exists 181
\DTLisieq:new 63		\DTLplotlines: fixed error in
\DTLisigt:new 63		solid line setting 260

2.0	
\@DTLforeach: updated to use new database structure	118
\@DTLifdbempty: new	87
\@DTLremove: new	146
\@dtl@after: new	93
\@dtl@assign: updated to use new database structure	100
\@dtl@before: new	93
\@dtl@colhead: new	93
\@dtl@decrementrows: new ..	144
\@dtl@getcolumnindex: new ..	89
\@dtl@getdatatype: new	92
\@dtl@getprops: new	93
\@dtl@getsortdirection: modified to use \ifx instead of \ifthenelse	164
\@dtl@list: new	158
\@dtl@setnull: modified to use new database structure	101
\@dtl@sortcriteria: updated to take account of new database structure	162
\@dtl@updatekeys: new	94
\@dtl@getdatatype: new	92
\@dtl@ifreadonly: new	126
\@dtl@loaddb: changed \ifthenelse to \ifx to improve efficiency changed \whiledo to \loop to improve efficiency	173, 175
\@sDTLforeach: updated to use new database structure	123
\@sDTLnewrow: new	87
\@sdtl@getdatatype: new	92
General: added etex as a required package	81
removed \@dtl@getidtype ..	100
removed \@dtl@ifrowcontains	100
removed \@dtl@setidtype ..	100
removed \@dtl@setkeys ...	100
removed \@dtl@getentryid ..	100
removed \@dtl@getentryvalue	100
\dtl@compare@: updated to use new database structure	165
\dtl@decrementrows: new ...	144
\dtl@gathervalues: updated to use new database structure ..	104
\dtl@sortdata: new	159
\dtladdalign: new	135
\DTLaddentryforrow: updated to use new database structure	132
\dtlaftercols: new	134
\DTLappendtorow: updated to use new database structure ..	126
\DTLbarchart: added \DTLeverybarhook	237
\dtlbeforecols: new	134
\dtlbetweencols: new	134
\DTLcolumncount: new	86
\dtlcolumnindex: new	90
\dtlcolumnnum: new	88
\dtlcurrencyformat: new ...	136
\DTLcurrencytype: new	91
\dtldisplayafterhead: new ..	136
\DTLdisplaydb: new	137
\dtldisplayendtab: new	136
\DTLdisplaylongdb: new	139
\dtldisplaystartrow: new ..	136
\dtldisplaystarttab: new ..	136
\DTLeverybarhook: new	230
\DTLforeachkeyinrow: updated to use new database structure	132
\DTLgetcolumnindex: new	89
\DTLgetdatatype: new	92
\dtlgetentryfromcurrentrow: new	108
\DTLgetrowforkey: update to use new database structure ..	157
\DTLgetvalueforkey: updated to use new database structure	157
\dtlheaderformat: new	136
\DTLiffirstrow: modified to have different definition de- pending on location	133
\DTLifhaskey: new	88
\DTLiflastrow: modified to have different definition depending on location	134
\DTLifoddrow: modified to have different definition depending on location	134
\dtlintformat: new	136
\DTLinttype: new	91
\DTLloaddb: added optional ar- gument	172

removed checks to see if the database exists when adding to it	172	\DTLunsettype: new	91
\DTLmaxforcolumn: new	155	\DTLvarianceforcolumn: new	151
\DTLmaxforkeys: added second optional argument	154	\DTLvarianceforkeys: added second optional argument .	150
\DTLmeanforcolumn: new	149	2.01 \@dtl@sortcriteria: fixed sort direction	164
\DTLmeanforkeys: added second optional argument	148	2.02 \DTLsavedb: Fixed bug that didn't set the filename	167
\DTLminforcolumn: new	154	2.03 \@dtl@assigncmd: modified to ignore spaces after commas	100
\DTLminforkeys: added second optional argument	153	\@sDTLnewdbentry: value can be expanded before adding to database	99
\DTLmultibarchart: added \DTLeverybarhook	244	\DTLappendtorow: value expanded before storing	127
\DTLnewdb: Changed way database is stored	85	\DTLcleardb: new	85
\dtlrealformat: new	136	\dtlcolumnindex: renamed \dtl@columnindex to \dtlcolumnindex	90
\DTLrealtype: new	91	\DTLdeletedb: new	86
\DTLremovecurrentrow: updated to use new database structure	131	\DTLreplaceentryforrow: expand replacement entry ...	130
\DTLremoveentryfromrow: updated to use new database structure	127	\DTLsavedb: Moved outside loop	169
\DTLremoverow: new	145	2.10 \@dtl@construct@qlopoff: Added code to replace escaped delimiters	82
\DTLreplaceentryforrow: updated to use new database structure	129	\@dtl@getkeyforcolumn: fixed bug	91
\dtlrownum: new	88	\@dtl@ifDigitOrDecimalSep: Rewritten	38
\DTLsavedb: updated to use new database structure	167	\@dtl@starttrim: added check in the event there's no trailing space	177
\DTLsavetexdb: updated to use new database structure	169	\@dtlloaddb: add generic header if missing	173
\DTLsdforcolumn: new	152	added code to skip lines	172
\DTLsdforkeys: added second optional argument	152	changed \ifx to \ifdefempty	175
\dtlshowdb: updated to use new database structure	180	General: added omitlines key ..	171
\dtlshowdbkeys: updated to use new database structure	180	\dtl@domappings: replaced \DTLsubstitute with \DTLsubstituteall	179
\dtlshowtype: updated to use new database structure	180	\dtlappendentrytocurrentrow: new	108
\DTLsort: updated to use new data structure	158	\DTLassign: new	100
\dtlstringformat: new	136		
\DTLstringtype: new	91		
\DTLsumcolumn: new	147		
\DTLsumforkeys: added second optional argument	147		

\DTLdisplaydb: added optional arg	137	new	107
\DTLdisplaylongdb: added omit option	139	\dtlreplaceentryincurrentrow: new	106
\DTLifnumeq: changed \FPifeq to \dtlifnumeq	52	\DTLsettabseparator: changed tab character to ^^I	81
\DTLifnumgt: changed \FPifgt to \dtlifnumgt	51	\DTLsubstituteall: added \long	36
\DTLifnumlt: changed \FPiflt to \dtlifnumlt	42	\dtlswapentriesincurrentrow: new	107
\dtlrecombineomitcurrent: new	105	\long@addto@envbody:new	4
\dtlremoveentryincurrentrow:		\long@collect@@body:new	4
		\long@push@begins:new	4